Vaping, JUUL and E-Cigarettes: A Public Health Crisis

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American Osteopathic Association of Addiction Medicine
Disclosure

• Neither presenter has any conflicts of interest or disclosures to address
Learning Objectives

1. Discuss the **known and potential risks** of e-cigarettes, vape devices, and pod systems (i.e. JUUL)

2. Review **methods to screen and counsel** patients and families

3. Identify **resources** to help patients understand risks
A Public Health Crisis

Sept 18, 2019

Former FDA Commissioner Dr. Scott Gottlieb:

“We have an obligation to act on what we know. And what we know is very disturbing. Kids use of e-cigarettes has reached an epidemic level of growth.”
A Public Health Crisis

- In 2018, **20.8%** of high school students used e-cigarettes in the past month.
- E-cigarettes are the **MOST POPULAR** tobacco product used by adolescents.
- Rates of use increased by **78%** from 2017-2018.

Wang TW. MMWR (2018)
Electronic Nicotine Delivery Systems

Image Source: FDA

Cig-a-Likes * Vape Pens * Mods * Advanced Personal Vaporizers * E-cigars/Pipes * Pod Systems
Terminology

- E-cigs
- Vape pens, vapes
- E-cigars
- E-hookah
- Mods
- Personal vaporizers
- JUULs
UNDER THE RADAR
The sleek Juul device has captured about half of the e-cig market. But the features that make it so attractive to the general public also make it easy for teens to conceal.

Discreet vapor
The exhaled aerosol doesn’t leave a smell that lingers like cigarettes.

Assorted flavors
Prepackaged pods containing liquid nicotine, glycerine, and other chemicals come in flavors like mango and creme.

“Smart” inhaler
With no temperature setting or start buttons, a simple inhale triggers the vaporizer.

Easy-to-hide look
The device resembles a flash drive and is about the length of a cigarette.

USB charging
Packs
How e-cigarettes work

- Heating coil
- Nicotine cartridge
- Atomiser
- Vaporising chamber
- Voltage control
- Rechargeable battery
- LED indicator
VAPENG IS FAR MORE POPULAR THAN SMOKING IN HIGH SCHOOLS NOW

Percentage of high schoolers who, in the past month, have:

- Smoked: 6% (2019)
- Vaped: 16% (2011)
- Vaped: 28% (2019)

TEENS ARE VAPING AT A MUCH HIGHER RATE THAN ADULTS ARE

- Percentage of vapers, among high schoolers: 28%
- Percentage of vapers, among adults: 3%

DRAWN IN PART BY THE ADDICTIVE NICOTINE

One Juul pod delivers the same amount of nicotine as a pack of 20 cigarettes

THAT CAN LEAD TO LONG-TERM USE

28% of teen vapers said they had used an e-cig on at least 20 of the past 30 days

SOURCES: NATIONAL YOUTH TOBACCO SURVEY, CDC; JUUL LABS INC.; TRUTH INITIATIVE; PEDIATRICS. 2019. VOL. 141
NOTE: FIGURES REFLECT MOST RECENTLY AVAILABLE SURVEYS. 2019 FIGURES PRELIMINARY
E-Liquid

- Nicotine (0-59+ mg/ml)
- Propylene Glycol
- Vegetable Glycerin
- Flavoring
- Other compounds

https://commons.wikimedia.org/wiki/File:Various_E-liquid_Bottles.jpg
Flavoring

Flavor categories

• **Fruit, Dessert/Sweet**
• Tobacco
• Menthol/mint
• Alcohol Nuts/spices
• Coffee/tea
• Beverage
• Unflavored

Pod Systems: JUUL

- 5% nicotine: 59 mg/ml

- Flavors
  - Fruit
  - Mango
  - Mint
  - Virginia Tobacco
  - Classic Tobacco
  - Cucumber
  - Creme

10% of 15-17 year olds have ever tried JUUL

www.juul.com
Four hundred and sixty brands of e-cigarettes and counting: implications for product regulation

Shu-Hong Zhu, Jessica Y Sun, Erika Bonnevie, Sharon E Cummins, Anthony Gamst, Lu Yin, Madeleine Lee

Abstract

Introduction E-cigarettes are largely unregulated and internet sales are substantial. This study examines how the online market for e-cigarettes has changed over time, in product design and in marketing messages appearing on websites.

Methods Comprehensive internet searches of English-language websites from May–August 2012 and December 2013–January 2014 identified brands, models, flavours, nicotine strengths, ingredients and product claims. Brands were divided into older and newer groups (by the two searches) for comparison.

Results By January 2014 there were 466 brands (each with its own website) and 7764 unique flavours. In the 17 months between the searches, there was a net increase of 10.5 brands and 242 new flavours per month. Older brands were more likely than newer brands to offer cigalikes (86.9% vs 52.1%, p<0.01), and newer brands more likely to offer the more versatile eGos and mods (75.3% vs 57.8%, p<0.01). Older brands were significantly more likely to claim that they were healthier and cheaper than cigarettes, were good substitutes where smoking was banned and were effective smoking cessation aids. Newer brands offered more flavours per brand (49 vs 32, p<0.01) and were less likely to compare themselves with conventional cigarettes.

Conclusions The number of e-cigarette brands is large and has been increasing. Older brands tend to highlight their advantages over conventional cigarettes while newer brands emphasise consumer choice in multiple flavours and product versatility. These results can serve as a benchmark for future research on the impact of upcoming regulations on product design and advertising messages of e-cigarettes.
What’s In a JUUL Pod?

JUULPODS INGREDIENTS

Through years of research, JUUL Labs developed its proprietary e-liquid formula, which is mixed under strict quality controlled processes utilizing industry leading U.S. partners.

PROPYLENE GLYCOL AND GLYCERINE (30/60 MIX)

(UP TO 90%)

Propylene glycol and glycerine are clear liquids that are used to create a visible vapor, and are commonly used by the medical, beauty and food industries. A majority, if not all e-liquids, contain propylene glycol (PG).

BENZOIC ACID

Benzoic acid is a naturally occurring ingredient, found in tobacco and other substances. When combined with nicotine as part of our nicotine salts formulation, it helps provide cigarette-like satisfaction.

NICOTINE

Nicotine is a stimulant that comes from the tobacco plant. We use highly purified/USP grade/pharmaceutical grade nicotine.

FLAVOR

JUUL flavors consist of both naturally occurring and artificial flavor ingredients which provide the specific taste profile for each flavor.
Electronic Cigarette Sales in the United States, 2013-2017


Pod Systems
Known and potential risks

Risks

1. Initiation of combustible tobacco products
2. Nicotine addiction
3. Safety risks
4. Long term health risks
### Association Between Initial Use of e-Cigarettes and Subsequent Cigarette Smoking Among Adolescents and Young Adults

<table>
<thead>
<tr>
<th>Source</th>
<th>Probability of Cigarette Smoking Initiation, %</th>
<th>Unadjusted OR (95% CI)</th>
<th>Adjusted OR (95% CI)</th>
<th>Weight, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miech et al, 2017</td>
<td>Ever e-Cigarette Users: 31.1</td>
<td>6.23 (1.57-24.63)</td>
<td>4.78 (1.91-11.96)</td>
<td>11.1</td>
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<tr>
<td></td>
<td>Never e-Cigarette Users: 6.8</td>
<td></td>
<td></td>
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<tr>
<td>Spindle et al, 2017</td>
<td>Ever e-Cigarette Users: 29.4</td>
<td>3.50 (2.41-5.09)</td>
<td>3.37 (1.91-5.94)</td>
<td>18.1</td>
</tr>
<tr>
<td></td>
<td>Never e-Cigarette Users: 10.6</td>
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</tr>
<tr>
<td>Primack et al, 2016</td>
<td>Ever e-Cigarette Users: 37.5</td>
<td>6.06 (2.15-17.10)</td>
<td>6.82 (1.65-28.22)</td>
<td>5.9</td>
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<tr>
<td></td>
<td>Never e-Cigarette Users: 9.0</td>
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<tr>
<td>Barrington-Trimis et al, 2016</td>
<td>Ever e-Cigarette Users: 40.4</td>
<td>5.76 (3.12-10.66)</td>
<td>6.17 (3.29-11.57)</td>
<td>16.6</td>
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<td></td>
<td>Never e-Cigarette Users: 10.5</td>
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<tr>
<td>Wills et al, 2016</td>
<td>Ever e-Cigarette Users: 19.5</td>
<td>4.25 (2.74-6.61)</td>
<td>2.87 (2.03-4.05)</td>
<td>23.9</td>
</tr>
<tr>
<td></td>
<td>Never e-Cigarette Users: 5.4</td>
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<tr>
<td>Primack et al, 2015</td>
<td>Ever e-Cigarette Users: 37.5</td>
<td>5.66 (1.99-16.07)</td>
<td>8.30 (1.19-58.00)</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td>Never e-Cigarette Users: 9.6</td>
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<tr>
<td>Leventhal et al, 2015</td>
<td>Ever e-Cigarette Users: 8.8</td>
<td>2.65 (1.73-4.05)</td>
<td>1.75 (1.10-2.78)</td>
<td>20.8</td>
</tr>
<tr>
<td></td>
<td>Never e-Cigarette Users: 3.1</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Total</strong></td>
<td>Ever e-Cigarette Users: 23.2</td>
<td>3.83 (3.74-3.91)</td>
<td><strong>3.50 (2.38-5.16)</strong></td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Never e-Cigarette Users: 7.2</td>
<td></td>
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</tr>
</tbody>
</table>

Heterogeneity: \( t^2 = 0.13; Q_E = 13.79; P = .03; I^2 = 56\%
Test for overall effect: \( z = 6.34; P < .001 \)
Conclusion 16-1:
There is substantial evidence that e-cigarette use increases risk of ever using combustible tobacco cigarettes among youth and young adults.
Nicotine Addiction

The adolescent brain is uniquely vulnerable to the rewarding effects of nicotine

Nicotine Addiction

E-cigarettes can deliver higher levels of nicotine than traditional cigarettes.

Pod system e-liquids (including JUUL):

59 mg/ml

Of JUUL users do not know that the product always contains nicotine.

63%

USDHHS. E-cigarette Use Among Youth and Young Adults: A Report of the Surgeon General. (2016)
Source: www.juul.com
Willett JG. Tobacco Control (2018)
Nicotine Addiction

- Nicotine salts
- Free base nicotine + benzoic acid
- May allow nicotine to be delivered at high concentrations without throat irritation

Duell AK et. al. Research in Toxicology (2018)
E-CIGARETTE EMISSIONS

Conclusion 5-1:

There is conclusive evidence that in addition to nicotine, most e-cigarette products contain and emit numerous potentially toxic substances.
Safety Risks

- **Burns**
  - 2,035 explosion and burn injuries seen in US Emergency Departments from 2015-2017

- **Poisonings**
  - 8,269 liquid nicotine exposures reported among children <6 from 2012-2017
  - Child-resistant packaging laws associated with decreasing exposure rates

Rossheim ME et al. Tob Control (2018)
Lung Injury

What we know

- As of October 1, 2019, 1,080* lung injury cases associated with using e-cigarette, or vaping, products have been reported to CDC from 48 states and 1 U.S. territory.
- Eighteen deaths have been confirmed in 15 states.
- All patients have reported a history of using e-cigarette, or vaping, products.
- Most patients report a history of using THC-containing products. The latest national and regional findings suggest products containing THC play a role in the outbreak.
- Approximately 70% of patients are male.
- Approximately 80% of patients are under 35 years old.
  - 16% of patients are under 18 years old
  - 21% of patients are 18 to 20 years old
Lung Injury

Vitamin E acetate is now a focus of the investigation into vaping-related respiratory illnesses that have sickened 34 people in New York, state health officials say.

As of Thursday afternoon, there have been 361 confirmed or suspected cases reported by state health departments nationwide. Two people have died, one in Illinois and the other in Oregon.

On Thursday, the New York State Department of Health said lab tests showed extremely high levels of vitamin E acetate in nearly all of the analyzed samples of products that contained cannabis.

Vitamin E acetate was not found in the nicotine products tested.
? Long Term Health Impact

- The health effects are not completely understood.

- There is evidence that completely switching to e-cigarettes from cigarettes reduces exposure to toxicants and carcinogens. (National Academies Report)

- Concerns with
  - Inhalation of ultrafine particles deep into the lung
  - Exposure to heavy metals in e-cigarette aerosol (nickel, lead, tin)
  - Exposure to volatile organic compounds

E-cigarettes.surgeongeneral.gov
E-Cigarettes As Smoking Cessation

**RESULTS**

A total of 886 participants underwent randomization. The 1-year abstinence rate was 18.0% in the e-cigarette group, as compared with 9.9% in the nicotine-replacement group (relative risk, 1.83; 95% confidence interval [CI], 1.30 to 2.58; P<0.001). Among participants with 1-year abstinence, those in the e-cigarette group were more likely than those in the nicotine-replacement group to use their assigned product at 52 weeks (80% [63 of 79 participants] vs. 9% [4 of 44 participants]). Overall, throat or mouth irritation was reported more frequently in the e-cigarette group (65.3%, vs. 51.2% in the nicotine-replacement group) and nausea more frequently in the nicotine-replacement group (37.9%, vs. 31.3% in the e-cigarette group). The e-cigarette group reported greater declines in the incidence of cough and phlegm production from baseline to 52 weeks than did the nicotine-replacement group (relative risk for cough, 0.8; 95% CI, 0.6 to 0.9; relative risk for phlegm, 0.7; 95% CI, 0.6 to 0.9). There were no significant between-group differences in the incidence of wheezing or shortness of breath.
The “Harm Reduction” Aspect

Results

Whereas 11.5% and 1.3% of adults perceived e-cigarettes to have about the same level of harm and to be more harmful than cigarettes, respectively, in 2012, 35.7% and 4.1% did so in 2015. The proportion of adults who thought e-cigarettes were addictive more than doubled during 2012–2015 (32.0% in 2012 vs 67.6% in 2015). Compared with 2012, the odds of perceiving e-cigarettes to be equally or more harmful (than to be less harmful) doubled (95% CI=1.64, 2.41) in 2014, and tripled (95% CI=2.60, 3.81) in 2015.

Conclusions

There is an increase in the proportion of U.S. adults who misperceive the harm of e-cigarettes and consider them to be as harmful as combustible cigarettes. The study highlights the need to design public health messages that accurately interpret the scientific data on the potential harm of e-cigarettes and clearly differentiate the absolute from the relative harm of e-cigarettes.
SUD and Tobacco

63.5% of adult cigarette smokers reported co-use of alcohol in 2016 compared to 52.8% of adult non-smokers.\(^4\)

<table>
<thead>
<tr>
<th>Drug Use (in past month)</th>
<th>Smokers (25.3%)</th>
<th>Non-Smokers (7.1%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current illicit drug use</td>
<td>25.3%</td>
<td>7.1%</td>
</tr>
<tr>
<td>Marijuana</td>
<td>21.8%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Cocaine</td>
<td>2.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Heroin</td>
<td>0.8%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Hallucinogens</td>
<td>1.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Inhalants</td>
<td>0.4%</td>
<td>0.1%</td>
</tr>
<tr>
<td>Non-medical use of prescription drugs</td>
<td>5.9%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Current alcohol use (in past month)</td>
<td>63.5%</td>
<td>52.8%</td>
</tr>
<tr>
<td>Binge drinking(^5)</td>
<td>43.5%</td>
<td>21.7%</td>
</tr>
<tr>
<td>Heavy drinking(^6)</td>
<td>14.6%</td>
<td>4.5%</td>
</tr>
</tbody>
</table>

\(^4\) Data taken from the National Survey on Drug Use and Health, 2016, and refer to persons aged 18 years and older reporting smoking, drug, and/or alcohol use in the past 30 days.

\(^5\) Binge alcohol use is defined as drinking five or more drinks on the same occasion (i.e., at the same time or within a couple of hours of each other) on at least 1 day in the past 30 days.

\(^6\) Heavy alcohol use is defined as drinking five or more drinks on the same occasion on each of 5 or more days in the past 30 days; all heavy alcohol users are also binge alcohol users.
Adults with Mental Illness or Substance Use Disorder Account for 40 Percent of All Cigarettes Smoked

The mental illness estimates presented in this publication may differ from estimates in other publications due to revisions to the mental illness estimation methods in 2013. For more information, see “Revised Estimates of Mental Illness from the National Survey on Drug Use and Health” at http://samhsa.gov/data/default.aspx.
Known and potential risks

Methods to screen and counsel

Risks

1. Initiation of combustible tobacco products
2. Nicotine Addiction
3. Safety risks
4. Long term health risks
Screen and Counsel

1. Include e-cigarette terminology in tobacco screening.

2. Educate patients and families about the health risks of e-cigarettes.
• Using E-cigarettes

• Vaping

• JUULing
Screen and Counsel

1. Include e-cigarette terminology in tobacco screening.

2. Educate patients and families about the health risks of e-cigarettes.
E-cigarette advertising

• 7 in 10 teens were exposed to e-cigarette advertisements in 2016
E-cigarettes advertising

- 7 in 10 teens were exposed to e-cigarette advertisements in 2016:
  - 68% in retail stores
  - 40% online
  - 38% on television
  - 24% in newspapers/magazines

Marynak K et al. MMWR (2018)
E-cigarette advertising

**Receptivity to e-cigarette advertising is associated with trying e-cigarettes and cigarettes in the future**

Source: E-cigarette Marketing Web Archive (UCSF Industry Documents Library)
Profit Incentive

- Juul
- $1.2 Billion sales (Jan – Jun 2019)
- 2016-- 2.2 million units
- 2017-- 16.2 million units
Profit Incentive

• James Monsees (39) and Adam Bowen (44)

• Stanford University -- smoke break 2005

• Cessation?

• Ploom 2007

• Pax Labs cannabis
Tobacco Advertising

Public Health Cigarette Smoking Act of 1969

- Required package warning label—Warning: The Surgeon General Has Determined that Cigarette Smoking Is Dangerous to Your Health” (other health warnings prohibited)
- Temporarily preempted FTC requirement of health labels on advertisements
- Prohibited cigarette advertising on television and radio (authority to Department of Justice [DOJ])
- Prevents states or localities from regulating or prohibiting cigarette advertising or promotion for health-related reasons
Tobacco Advertising

Counsel About Risks

Known and potential risks

Methods to screen and counsel

Resources

"Tobacco use among youth and young adults in any form, including e-cigarettes, is not safe"

E-cigarettes.surgeongeneral.gov
Counsel About Risks of Nicotine

Nicotine is very common in e-cigarettes.

Nicotine can harm the developing adolescent brain. The brain keeps developing until about age 25.

E-cigarettes.surgeongeneral.gov
Counsel About Risks of Nicotine

NICOTINE CAN CAUSE ADDICTION
Counsel About Health Risks

Scientists are still learning about the long-term health effects of e-cigarettes.

Some of the ingredients in e-cigarettes could be harmful to the lungs in the long-term.

E-cigarettes.surgeongeneral.gov
Point of Care Actions

**Screening**

**Brief Intervention**

**Referral**

**Treatment**

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASK</td>
<td>about tobacco USE</td>
</tr>
<tr>
<td>ADVISE</td>
<td>tobacco users to QUIT</td>
</tr>
<tr>
<td>ASSESS</td>
<td>readiness to make a QUIT attempt</td>
</tr>
<tr>
<td>ASSIST</td>
<td>with the QUIT ATTEMPT</td>
</tr>
<tr>
<td>ARRANGE</td>
<td>FOLLOW-UP care</td>
</tr>
</tbody>
</table>
Counsel About Health Risks

- Defective e-cigarette batteries have caused fires and explosions.

- Children and adults have been poisoned by swallowing, breathing, or absorbing e-cigarette liquid through their skin or eyes.
E-cigarettes.surgeongeneral.gov

Known and potential risks

Methods to screen and counsel

Resources

AAP Richmond Center: www.richmondcenter.org
Summary

1. E-cigarettes are **the most common tobacco product** used by adolescents.

2. There are **substantial risks** associated with trying e-cigarettes.

3. **Screen** all patients for tobacco exposure, and include e-cigarette terminology in tobacco screening.

4. **Educate** patients and families about the health risks of e-cigarettes.
Changes You May Wish to Make in Practice

1. Screen all patients for tobacco exposure, and include e-cigarettes in your tobacco screening.

2. Educate patients and families about the health risks of e-cigarettes.

Thank you!
• Audience-Specific Resources
• State-Specific Resources
• Cessation Information
• Funding Opportunities
• Reimbursement Information
• Tobacco Control E-mail List
• Pediatric Tobacco Control Guide
• Tobacco Prevention Policy Tool

www.aap.org/richmondcenter
AAP Policy Statement

AAP tobacco control and e-cigarette policy:
https://www.aap.org/en-us/about-the-aap/Sections/Section-on-Tobacco-Control/Pages/Policy.aspx
Acknowledgments

• Deepa Camenga, MD MHS FAAP, Yale School of Medicine, New Haven CT
• AAP Julius B. Richmond Center of Excellence
• AAP Section on Tobacco Control
• Risa Turetsky, MPH, FNP-C, PHN
Resources

• [https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html)


• Changing Perceptions of Harm of e-Cigarette vs Cigarette Use Among Adults in 2 US National Surveys From 2012 to 2017; Jidong Huang, PhD¹; Bo Feng, PhD²,³; Scott R. Weaver, PhD⁴; et al

• National Survey on Drug Use and Health (2016) – accessed via samhsa.gov

• Remainder of sources are cited on the slides themselves