Responding to the adolescent vaping epidemic: a case-based discussion

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Disclosures

• None
Inside the e-cigarette...

Propylene glycol
Glycerin
Nicotine

Water
Flavoring

Potentially toxic contaminants
and vaporization by-products

VAPOR

Battery

Heating element in the atomization chamber vaporizes the nicotine solution.

Nicotine cartridge holds the nicotine solution. The nicotine content may be high, medium, low, or none.

Mouthpiece
Vaping devices/e-cigarettes

- E-pipe
- E-cigar
- Large-size tank devices
- Medium-size tank devices
- Rechargeable e-cigarette
- Disposable e-cigarette

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CHU Sainte-Justine Research Center
Mother and Child University Hospital Center

Université de Montréal
Jeremy

- 15 years old, high school, soccer player, oldest of three children
- Severe persistent asthma, last hospitalization 6 months ago
- Caught vaping in the bathroom at school
Jeremy

- Uses a JUUL he found at school, and has recently started smoking a “few cigarettes a week”
- Likes the “head rush” and social aspect of “JUULing”
- Uses high nicotine concentration pods/e-liquids and estimates his use to approximately 1-2 JUUL pods per week
- Says he would quit smoking, but is not interested in quitting vaping “it helps with my anxiety”
Jeremy

• What would you tell Jeremy about smoking/vaping?
• What other questions would you like to ask him?
• How could you help him quit smoking/vaping?
Percentage of U.S. middle/high school students who report using tobacco products in past 30 days

In 2018...
- 27.1% any tobacco prod.
- 20.1% e-cigarettes
- 7.2% of middle schoolers

↑ 38.3% from 2017
↑ 1,240% from 2011

Past 30-day use

NATIONAL YOUTH TOBACCO SURVEY*: YOUTH USE OF E-CIGARETTES CONTINUES TO CLIMB

* Preliminary data
  * Reported use within 30 days preceding administration of survey.
## Table 1. Prevalence of Nicotine Vaping among Adolescents, 2017–2019.*

<table>
<thead>
<tr>
<th>Reporting Interval and Grade in School</th>
<th>Prevalence in 2017 (95% CI)</th>
<th>Prevalence in 2018 (95% CI)</th>
<th>Prevalence in 2019 (95% CI)</th>
<th>Change, 2018 to 2019 (95% CI)†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past 30 days</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>12th grade</td>
<td>11.0 (9.2–13.0)</td>
<td>20.9 (17.7–24.5)</td>
<td>25.4 (22.6–28.4)</td>
<td>4.5 (0.9–8.1)</td>
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<tr>
<td>10th grade</td>
<td>8.2 (6.6–10.2)</td>
<td>16.1 (14.0–18.6)</td>
<td>20.2 (17.8–22.8)</td>
<td>4.1 (0.9–7.2)</td>
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<tr>
<td>8th grade</td>
<td>3.5 (2.9–4.2)</td>
<td>6.1 (5.1–7.4)</td>
<td>9.0 (7.6–10.5)</td>
<td>2.8 (1.2–4.4)</td>
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<tr>
<td>Past 12 months</td>
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<tr>
<td>12th grade</td>
<td>18.8 (16.5–21.4)</td>
<td>29.7 (26.1–33.6)</td>
<td>35.1 (31.8–38.6)</td>
<td>5.4 (1.1–9.6)</td>
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<tr>
<td>10th grade</td>
<td>15.8 (13.6–18.3)</td>
<td>24.7 (21.9–27.7)</td>
<td>31.1 (28.3–34.0)</td>
<td>6.4 (2.7–10.1)</td>
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<tr>
<td>8th grade</td>
<td>7.5 (6.6–8.5)</td>
<td>10.9 (9.4–12.6)</td>
<td>16.1 (14.1–18.2)</td>
<td>5.2 (2.8–7.6)</td>
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<tr>
<td>Ever</td>
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<tr>
<td>12th grade</td>
<td>25.0 (22.4–27.7)</td>
<td>34.0 (30.3–38.0)</td>
<td>40.5 (37.3–43.8)</td>
<td>6.5 (2.3–10.7)</td>
</tr>
<tr>
<td>10th grade</td>
<td>21.4 (19.2–23.9)</td>
<td>28.6 (25.8–31.6)</td>
<td>36.4 (33.5–39.4)</td>
<td>7.7 (4.0–11.5)</td>
</tr>
<tr>
<td>8th grade</td>
<td>10.6 (9.5–11.8)</td>
<td>13.5 (11.8–15.3)</td>
<td>20.7 (18.5–23.1)</td>
<td>7.2 (4.6–9.9)</td>
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<tr>
<td>Daily‡</td>
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<tr>
<td>12th grade</td>
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<td>11.7 (9.8–14.0)</td>
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</tr>
<tr>
<td>8th grade</td>
<td>—</td>
<td>—</td>
<td>1.9 (1.4–2.5)</td>
<td>—</td>
</tr>
</tbody>
</table>

Increasing **frequent** e-cigarette use

*Among e-cig users, percent using >20 days in past 30 days*

High school e-cigarette users are using them more often.

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>2017</td>
<td>20%</td>
</tr>
<tr>
<td>2018</td>
<td>28%</td>
</tr>
</tbody>
</table>

Use more than 20 days in the past 30 days
E-cigarettes and...

- Those who use only e-cigs are potentially a new group of youth who would not have smoked otherwise (Dutra, 2017)
- E-cigarettes are positively and independently associated with progression to current established smoking (Chaffee, 2018)
- E-cigarette use associated with current and future marijuana use in youth (Chadi, 2019)
- E-cigarette use is strongly associated with use of alcohol and other drugs (Curran, 2018)
Depressive Symptoms and Suicidality in Adolescents Using e-Cigarettes and Marijuana

A Secondary Data Analysis From the Youth Risk Behavior Survey

Odds ratio of endorsing depressive and suicidal symptoms with past-year e-cigarette and/or marijuana use

- No use
- E-cigarettes only
- Marijuana only
- E-cigarettes and marijuana
The JUUL

- Pods contain e-liquid with highly absorbable nicotine salts
  - Heated into vapor and inhaled
- 1 JUUL pod = 0.7mL of nicotine (5% concentration)
  - Nicotine equivalent of **1 pack of cigarettes** (≈200 puffs)
- Youth-friendly flavors:
  - Mango
  - Mint
  - Crème
  - Cucumber
  - Fruit

JUULpods $15.99
Each pack contains 4 pods
JUUL pods (US)

**VIRGINIA TOBACCO**
5%, 3% Nicotine Strengths

[Image of Virginia Tobacco pod]

**MINT**
5%, 3% Nicotine Strengths

[Image of Mint pod]

**CLASSIC TOBACCO**
5%, 3% Nicotine Strengths

[Image of Classic Tobacco pod]

**MANGO**
5%, 3% Nicotine Strengths

[Image of Mango pod]

**CREME**
5%, 3% Nicotine Strengths

[Image of Creme pod]

**CUCUMBER**
5%, 3% Nicotine Strengths

[Image of Cucumber pod]

**FRUIT**
5%, 3% Nicotine Strengths

[Image of Fruit pod]

**MENTHOL**
5%, 3% Nicotine Strengths

[Image of Menthol pod]
JUUL pods (Canada)

JUULPODS  CANADA
Unavailable for online purchase in the province of Quebec

VIRGINIA TOBACCO
5%, 3%, 1.5% Nicotine Strengths
QUICK SHOP
LEARN MORE

MINT
5%, 3%, 1.5% Nicotine Strengths
QUICK SHOP
LEARN MORE

MANGO
5%, 3%, 1.5% Nicotine Strengths
QUICK SHOP
LEARN MORE

VANILLA
5%, 3%, 1.5% Nicotine Strengths
QUICK SHOP
LEARN MORE

FRUIT
5%, 3%, 1.5% Nicotine Strengths

CUCUMBER
5%, 3%, 1.5% Nicotine Strengths

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Which flavors are teens using?

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

![Bar chart showing the popularity of different flavors among high school e-cigarette users from 2017 to 2019. The chart indicates a decline in the popularity of fruit flavors, an increase in menthol or mint flavors, and a decrease in candy flavors over the years.]

* Preliminary NYTS data

**CHU Sainte-Justine Research Center**
**Université de Montréal**
New and emerging products
40% of teens using e-cigarettes unaware that they contain nicotine (Boykan, 2019)

Source: Monitoring the Future Survey, 2018
Screening to Brief Intervention (S2BI)

S2BI
In the past year, how many times have you used:

- Tobacco, nicotine or e-cigarettes (i.e. JUUL)?
- Alcohol?
- Marijuana?

<table>
<thead>
<tr>
<th>Weekly+</th>
<th>Weekly/ Monthly</th>
<th>Once or twice</th>
<th>Never</th>
</tr>
</thead>
</table>

Screening, Brief Intervention and Referral to Treatment (SBIRT)

Use validated screening tool to identify risk level and appropriate intervention

- Abstinence
  - Positive Reinforcement
- Substance use without a disorder
  - Brief Health Advice
- Mild/moderate substance use disorder
  - Brief Intervention

Referral to Treatment

The 5 As

Ask about use
Advise to quit
Assess readiness to quit
Assist in quit attempt
Arrange follow-up

SCREEN

BRIEF INTERVENTION

REFERRAL TO TREATMENT

Brief intervention

1. Use a patient-centered strengths-based approach
2. Advise adolescents to consider cessation
3. Provide information about health consequences
4. Use a non-judgmental approach
5. Determine readiness/willingness to quit (scale from 1 to 10)
Some terms you might hear...

• Vaping/e-cigarette products:
  • Brands: JUUL/JUULing, Vuse, MarkTen, blu e-cigs, and Logic, etc.
  • E-liquids, e-juice
  • Dabs, dab pens, dab cards – (marijuana)

• Techniques:
  • Drip, dripping or juicing – using e-liquids directly on heating coil
  • Ghosting – hiding e-cigarette vapor in the mouth/airways
  • JUUL challenges, stacking, “blinders” – using one or many JUULs to reach very levels of vapor/nicotine in the lungs

• Health effects/problems:
  • Getting “nicked” – Euphoria with high doses of nicotine
  • Getting “nic sick” – Heart palpitations, nausea/vomiting, light-headedness with nicotine e-cigarette overuse
Jeremy and Zack

• Three weeks after being suspended for using a JUUL at school, Jeremy returns to your office, this time with his friend Zack.

• Jeremy and Zack were “dripping” using a friend’s e-cigarette, when the device suddenly caught fire, burning Jeremy’s face.
Zack

• Zack is in tears and tells you he doesn’t want you to call his mother: “I’ll be grounded forever!”

• He tells you that he is afraid his mother will confiscate his JUUL: “I get horrible headaches when I can’t JUUL!”
Case discussion

- What are your next steps?
- What would you tell Zack’s mother?
- How would you address Zack’s headaches?
E-cigarettes: what are the risks?

• Brain risks
• Addiction
• Behavior risks:
  – Use of two or more tobacco products
  – Use of alcohol and other drugs
• Risks for the lungs and body
• Burn risks

https://e-cigarettes.surgeongeneral.gov/
Substance use and the teen brain

Activation of the reward pathway by addictive drugs

- Pre-frontal cortex
- Amygdala
- Nucleus accumbens
- Alcohol
- Cocaine
- Heroin
- Nicotine

Nicotine and the teen brain: long term effects

• Produces persistent changes in the brain

• **Long term** impacts:
  – **Increased risk for drug addiction**
    • including nicotine, marijuana, alcohol and cocaine
  – Impairments in **attention** capacity and **working memory**
  – Associated with **mood** disorders and **poor impulse control**
What is in an e-cigarette aerosol?

Dripping

- Thicker vapor
- Higher nicotine concentration (more addictive)
- Increased concentration and absorption of chemicals
- Burn risks with handling hot e-liquid
4th vaping-related death reported, CDC vows to find out 'what is making people sick'

By WILLIAM MANSELL  Sep 6, 2019, 6:12 PM ET

The CDC also said the agency is aware of 450 possible vaping-related cases in 33 states, including 215 that have been previously reported. While vaping has been around for more than a decade, the CDC said the recent spike in illnesses started around May or June of this year.
Burn risk

  - Alarming increases in rates of e-cigarette burns, often severe: risk of explosion
  - Most burns (72%) occur when device stored in front pocket
  - Multiple accounts of disfiguring facial burns
  - Manipulation of hot e-liquids during “dripping”
16-year-old, 2\textsuperscript{nd} degree burn

20-year-old, 2\textsuperscript{nd} degree thigh burn
Clinical Practice Policy to Protect Children From Tobacco, Nicotine, and Tobacco Smoke

- Screen all patients for tobacco exposure
- Advise patients to abstain from all forms of tobacco
- Do not recommend e-cigarettes for smoking cessation/reduction
- Offer counseling for nicotine cessation as a first step
- Consider pharmacotherapy for adolescent daily smokers
Treatment strategies for e-cigarette use

• How to best assist adolescents who want to quit vaping is currently unknown
Clinicians across the country report using the following techniques:

- **Patch**
  - 1+ pod/day: 21 mg
  - ½-1 pod per day: 14 mg
  - A few “hits” a day: 7 mg
- **Lozenges and gums**
  - As needed
- **Medications** used in adults (Bupropion, Varenicline)
- **Switching to lower nicotine concentration** products
- **Biofeedback**
- **CBT and MI**
Alexis (Zack’s older sister)

• Alexis, 17 years old, grade 12, in school dance troop
• Her mother calls you, she is very concerned
• She tells you that she has recently found an electronic cigarette and a device that Alexis called a “dab pen” in Alexis’ room
• She is concerned that Alexis’ vaping is affecting her grades at school
Alexis

• You meet with Alexis alone in clinic (you know her well) and share some of her mothers’ concerns

• Alexis tells you that she used to be a “straight-A student”, but that this year has been “a lot harder..."
Alexis

- Alexis also tells you that she is having frequent arguments at home “over almost everything”
- She admits to breaking curfew and house rules
- She then blushes and says that she took some money from her mom’s purse to buy dab cards and JUUL pods, but “only a few times”
Case discussion

• What other information would you like to obtain from Alexis?
• What would be your next steps to help Alexis in this situation?
• What would you tell her mother if she called you again the next day?
Privacy and confidentiality

• Important to clarify the limits of confidentiality
• Should be discussed with every adolescent at the beginning of every visit
• Encourage the adolescent to be honest/truthful
• Create a space where the youth will feel comfortable sharing sensitive information
• Reasons to breach confidentiality (i.e. to parents):
  – Self-harm/suicidality, harm to others, sexual abuse
Vaping marijuana?

“Premium wax vaporizer”

“Liquid shatter” pen
Vaping marijuana?

20-30% of teen e-cigarette users have tried it
(Monitoring the Future Survey 2018)

Teens often use highly concentrated products (THC/hash oils)

“Dab pens”: Vaporizers specially designed to vape cannabis concentrates
Marijuana: Effects on the Body
It affects everyone in different ways.

Brain: impairs...
- short term memory
- learning
- judgment
- coordination
- reaction time
- sensory perception

Mood:
- panic/anxiety
- depression
- paranoia
- lack of motivation
- mood swings
  (aggressive, irritable)

Lungs:
- damages airways
- asthma attack
- infections
- emphysema, cancer

Sexual function: low sex drive

Female:
- irregular periods
- fertility problems

Pregnancy:
- less oxygen to baby
- premature birth effects
- THC via placenta, umbilical cord, breast milk

Male:
- low testosterone
- low sperm production
- erectile dysfunction
- increased breast growth

Heart: raises...
- blood pressure
- heart rate
- risk of heart attack

More:
- weight gain
- lowers immune system
- chronic fatigue

Source: www.mass.gov/dph/bsas

BNI-ART Institute, Boston University School of Public Health
Alexis

• Three months later, Alexis has successfully cut down on her marijuana and e-cigarette use

• She is using a 7mg nicotine patch and nicotine lozenges and hopes to stop using it in the next few weeks

• Her grades are improving and she is getting along better with her parents
Alexis

• However, she tells you that she is feeling more anxious about school and has trouble sleeping at night

• She asks you what you think of “medical marijuana”: “I know you told me to cut down on marijuana, but my friend uses her dap pen to help her sleep, and she says it really helps...”
Case discussion

• What other information would you like to obtain from Alexis?

• What would you tell Alexis about “medical marijuana”?

• What would be your next steps in this situation?
Teens and “medical” marijuana?

• Limited research on the safety and effectiveness of medical marijuana products in minors

• CBD: Molecule found in marijuana that does not have the same psychoactive effects as THC on the brain
  • Many proposed benefits, but evidence remains limited
  • **Caution:** Products labelled as CBD often contain THC

• In most cases, potential risks of medical marijuana **outweigh potential benefits**
Conclusion
Take home messages

E-cigarettes carry **acute and long-term risks** that should be discussed with adolescents.

Screening for e-cigarette use with a validated screening tool followed by a brief intervention is **quick and effective**.

**Marijuana vaping** has now very common among youth and often involves use of high potency marijuana products.

Treatment approaches that are applicable to cigarette and tobacco use **can be applied to e-cigarette use**; more research is needed in this area.
Questions?
Thank you!