

E-cigarettes and Vaping The Good, the Bad and the Ugly

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Disclosures

- I have no conflicts of interest to disclose

Session Objectives

Upon the completion of this presentation, participants will be able to:

- Understand the design and ingredients of e-Cigarettes and Vaping devices
- Appraise the literature on vaping associated pulmonary injury (VAPI), and other known harms and the impact on practice and public health
- Evaluate current evidence on potential role for smoking cessation
- Apply best practices for primary care providers

Emma



- Emma, 26 year old woman
 - Here for her yearly well woman visit
- No complaints
- History
 - Began smoking at age 17, 1.5-2 packs per day
 - Worsening cough, decreased exercise tolerance
 - Acute bronchitis yearly over the previous 3 years
 - Unsuccessful attempts to quit smoking in the past

Emma

Rechargeable
E-cigarette

- Emma states:
 - "I have stopped smoking!" with vaping
 - Started at 12mg of nicotine now at 3mg and vaping 5-6 times per day
 - Exercising and not coughing anymore

Madison



- 19 year old woman, sophomore in college.
- Student Health Center - "cold symptoms, sinus pain" x 3 days
- History and PE consistent with viral URI
- During exam – a vaping device is noted tucked into Madison's bra

Madison

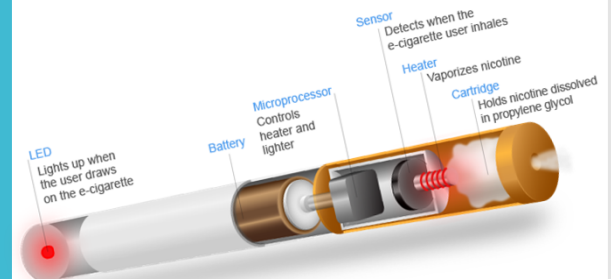


- Denies "smoking cigarettes"
- Smokes MJ – "occasionally" < 1-2 per month with friends
- Drinks 2-3 beers on weekend nights:
- Vapes "once in awhile" – once or twice a week
 - Just nicotine
- Has never smoked tobacco
- Nicotine gives her a "buzz" and helps her focus and study

E-cigs
E-hookahs
Hookah stick
E-cigars
Mechanical Mods
Vape pens
Vaping devices
Personal vaporizers

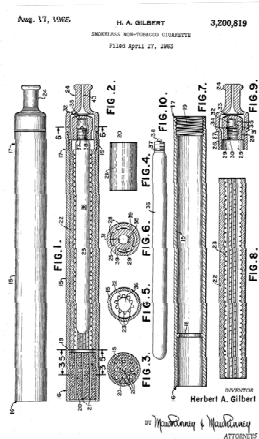
ENDS
Electronic Nicotine
Delivery System

Devices create an aerosol that is inhaled or *vaped*



Smokeless devices 1st designed over 80 years ago

E-cigarettes introduced in 2006-2007



- 1934 - earliest patent for a inhaler device
- 1965
 - H. A Gilbert - Prototype for current devices
- 2003-2007
 - Designed Hon Lik, 1st commercially produced E-cigarette
- 2006
 - Smokeless E-cigarettes introduced in Europe
- 2006-2007
 - Smokeless E-cigarettes introduced in US

Evolution of device design

4 generations



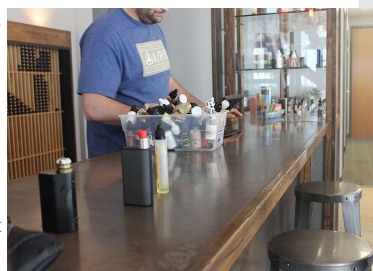
Devices are easily accessible in stores and online

Smoke shops – Vape Shops
Club stores, Supermarkets
• As long as they do not have pharmacies

Military commissary
Internet sales
From friends!

FDA new regulations

- Online
 - Stricter age check
- In person
 - No gas stations
 - No Convenience stores



1. The Commonwealth of Massachusetts HHS DPH. 12/28/2018. Memo to Pharmacists regarding sales of tobacco products. Massachusetts Tobacco Cessation and Prevention Program. <https://malegis.state.ma.us/Laws/SessionLaws/Acts/2018/Chapter157>
2. Pepper, J. K., Coats, E. M., Nonnemaker, J. M., & Loomis, B. R. (2018). How Do Adolescents Get Their E-Cigarettes and Other Electronic Vaping Devices? *American Journal of Health Promotion*, 0890127118790366.

Over 400 brands on the market

Over 7760 flavors on market

Most contain toxicants and carcinogens

- Nicotine
 - Traditional cigarette: 10-30mg
 - 0.05-3mg actually absorbed
 - ENDS varies greatly
- Propylene glycol
- Glycerol (Sugar) – fruit flavoring
- Aldehydes
- Metals
- Tobacco alkaloids, nitrosamines
- Hydrocarbons
- Diacetyl - *bronchiolitis obliterans*



• Allen JG, Flanigan SS, LeBlanc M, Vallarino J, MacNaughton P, Stewart JH, Christiani DC. 2016. Flavoring chemicals in e-cigarettes: diacetyl, 2,3-pentanedione, and acetoin in a sample of 53 products, including fruit-, candy-, and cocktail-flavored e-cigarettes. *Environ Health Perspect* 124:733-739. <http://dx.doi.org/10.1289/ehp.1530185>
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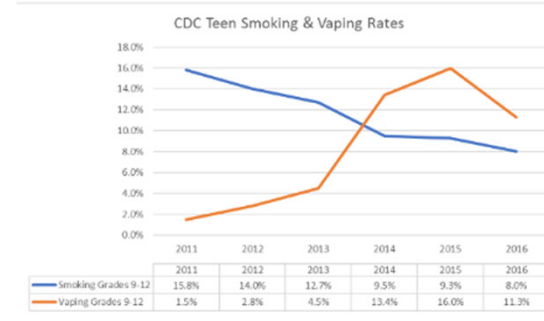
Recent trends show doubling of use in US teens 2017-2018

Almost 60% of adult END users also smoke

- 2015 – of adult ENDS users
 - 29.8% were former smokers
 - 58.8% were current regular smokers (dual use)
 - 11.4% had never been regular smokers
 - **40% of current ENDS users ages 18-24 years have never been cigarette smokers**
- 2018 – CDC and FDA estimated current teen ENDS users
 - Middle Schoolers 1 in 20 or 5% have tried ENDS
 - 2011 1% of middle schoolers
 - High Schoolers 1 in 5 or > 20% use ENDS
 - 2011 1.5% of HS students had tried ENDS
 - 27.7% HS students use regularly - CDC
- E-cigarettes are the most common tobacco product used among US youth
- Cigarette use declined

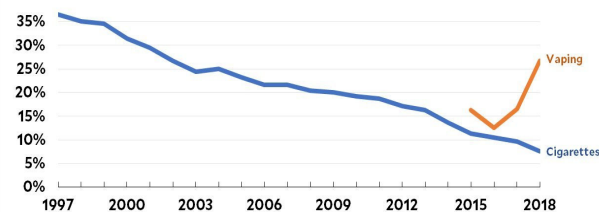
1. [Ha. https://www.cdc.gov/tobacco/basic_information/e-cigarettes/pdfs/Electronic-Cigarettes-Infographic-c08.pdf](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/pdfs/Electronic-Cigarettes-Infographic-c08.pdf)
 2. Adolescent Vaping and Nicotine Use in 2017–2018 — U.S. National Estimates. N Engl J Med 2019; 380:192–193. DOI: 10.1056/NEJMcl814130

Alarming Trend



Recent Data on Teen Vaping

Trends in Vaping and Cigarette Use 12th Graders



Source: "National Adolescent Drug Trends in 2018"

Mother Jones

A popular vapor product:
641% Sales Increase over ONE Year

2.2 -> 16.2 million
Increased market share 515%
Easy to use, Discrete
High nicotine concentration
Flavored
Similar feel of cigarette

See figure

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6233837/>

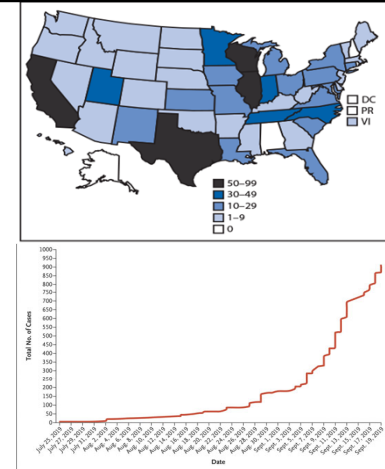
King BA, Gammon DG, Marynak KL, Rogers T. Electronic Cigarette Sales in the United States, 2013–2017. *JAMA*. 2018;320(13):1379–1380. doi:10.1001/jama.2018.10488

Vaping and Teens

Emerging epidemic and surging nicotine addiction rates



As of today > 1000 VAPI cases and 12 deaths



VAPI Epidemiology

CDC (MMWR)

- Demographics:
 - Males - 68.9%; Females - 30.4
 - Age
 - <18 - 16%
 - 18-24 - 38%
 - < 35 years - 78%
- Substances in vaping products
 - THC - 79.6%
 - Nicotine - 56.8%
 - Flavors - 19.8%
 - Unknown - 54.5%

VAPI Presentation

- Worsening signs/symptoms over several days
 - Cough
 - Shortness of breath
 - Fatigue
 - Fever
 - Nausea
 - Diarrhea
 - Anorexia
 - Pleuritic chest pain

Vaping Associated Pulmonary Illness (VAPI)

- Definition
 - History of e-Cigarette or dabbing in past 90 days
 - Imaging showing lung injury
 - Absence of infection
 - Absence of other plausible causes

Known and potential harms: exposures and injuries



- ENDS Second hand and Third hand aerosol pollutants
 - Residual aerosol that acts as dust on surfaces that can be re-emitted
- Burns and injury
- **Toxicants and carcinogens**
 - Diacetyl - *bronchiolitis obliterans*
- Risk to children
 - Increase in unintentional exposures and poisonings from ENDS
 - Nicotine poisoning increasing
 - 2016 - the Child Nicotine Poisoning Prevention Act
 - Nicotine on developing brain
 - Neurotoxic on developing brain

Rubinstein, M. L., Delucchi, K., Benowitz, N. L., & Ramo, D. E. (2018). Adolescent exposure to toxic volatile organic chemicals from e-cigarettes. *Pediatrics*, 141(4), e20173557.



Nicotine Highly addictive neuroactive substance

- Nicotine is highly addictive
- Teens are susceptible to addictive substances based on their neuroplasticity and rapid neuro-development
- Treating nicotine addiction in teens is extremely challenging
- Nicotine can harm developing brain
 - Brain develops until about age 25
 - Can impact:
 - Impulse control
 - Attention and learning
 - Memory acquisition
 - Changes synaptic formation and alters function
 - May increase risk of addiction to other substances

Surgeon General's Report: E-Cigarette Use Among Youth and Young Adults. https://www.cdc.gov/tobacco/data_statistics/sgr/e-cigarettes/pdfs/2016_sgr_entire_report_508.pdf

Possible association between ENDS use and MI risk

- Journal Of Preventive Medicine 2018
 - Cross sectional association between ENDS use and Cigarette Smoking and MI
 - National Health Interview Surveys 2014 and 2016
 - Increased odds of MI in **daily ENDS** users
 - Dual use of ENDS and cigarettes (most common use) increased odds of MI greater than END use or cigarette smoking alone

Alzahrani, Talal et al. Association Between Electronic Cigarette Use and Myocardial Infarction. *American Journal of Preventive Medicine* , Volume 55 , Issue 4 , 455 - 461

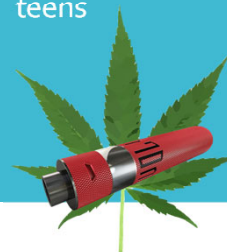
E-cigarette use is associated with initiation of smoking in teens



- Teens who have used ENDS are more likely than those who have not used ENDS to start smoking
- **Concern: Some teens users of ENDS go on to smoke who would not have started without access to ENDS**
 - This population now exposed to harms of smoking
- US Surgeon General declared teen ENDS use a public health concern

Barrington-Trimis JL, Kong G, Leventhal AM, et al. E-cigarette Use and Subsequent Smoking Frequency Among Adolescents. *Pediatrics*. 2018;142(6):e20180486

ENDS and MJ Rates are increasing in children and teens



- Study in *JAMA* National Youth Tobacco Survey data (NYTS)
 - Cross-sectional school-based survey of students **grades 6-12**
 - Among E-cigarette users:
 - HS students, **1 of 3 (1.7 million) and 1 of 4 (425,000) middle schoolers had ever used cannabis in E-cigarettes**
 - Use higher in boys and kids who lived with a smoker
- New study suggests increased effects from vaped MJ compared to smoked MJ

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Serious concerns regarding marijuana on developing teen brain



- National Academies of Science
 - MJ
 - Impacts learning, memory, possible lasting impact on academic achievement
- Recent study compared ETOH and Cannabis on adolescent cognition
 - Cannabis
 - Concurrent and lasting effects on important cognitive functions which appear to be more pronounced than ETOH

Morin, J. F. G., Afzali, M. H., Bourque, J., Stewart, S. H., Séguin, J. R., O'Leary-Barrett, M., & Conrod, P. J. (2018). A Population-Based Analysis of the Relationship Between Substance Use and Adolescent Cognitive Development. *American Journal of Psychiatry*, *appi-ajp*.

Recent study on ENDS and efficacy of smoking cessation – superior to NRT

- **2017 - Royal College of Physicians (UK) and Public Health England**
 - Promote ENDS and other NRT for smoking cessation
- **2019 – NEJM 1/30/19**
 - UK – 900 smokers
 - **ENDS outperformed NRT (like gum, patches) after 1 year with behavioral supports**
 - **18% vs 9.9%**



1. Hartmann-Boyce, J., Begh, R., & Aveyard, P. (2018). Electronic cigarettes for smoking cessation. *BMJ: British Medical Journal* (Online), 356.
2. Hajek, P., Phillips-Waller, A., Przulj, D., et al. A Randomized Trial of E-Cigarettes versus Nicotine-Replacement Therapy. *NEJM*. January 30, 2019;DOI: 10.1056/NEJMoa1807793

The FDA has not approved ENDS for smoking cessation
Consensus:
vaping most likely safer than tobacco smoking - more evidence is needed



- Centers for Disease Control and Prevention (CDC) 2018
"E-cigarettes are NOT safe for children, adolescents, pregnant women, and for anyone who is not currently smoking"
- US Preventive Services Task Force (USPSTF) 2015
Grade I - "Current evidence is *insufficient* to recommend electronic nicotine delivery systems (ENDS) for tobacco cessation - recommends other cessation interventions with established effectiveness and safety"
- American Cancer Society (ACS) 2018
Current generation of E-cigarettes are less harmful than smoking tobacco HOWEVER long term harms are unknown
 - Use FDA approved smoking cessation products

The American Academy of Pediatrics – Policy Statement February 2019

- The policy states the known and suspected harms to children and adolescents
- Conclusion:
 - "To prevent children, adolescents, and young adults from transitioning from e-cigarettes to traditional cigarettes and minimize the potential public health harm from e-cigarette use, there is a critical need for e-cigarette regulation, legislative action, and counter-promotion to protect youth."

Jenssen BP, Walley SC, AAP SECTION ON TOBACCO CONTROL. E-Cigarettes and Similar Devices. Pediatrics. 2019;143(2):e20183652

Breaking News

The New York Times
J... I Suspends Selling Most E-Cigarette Flavors in Stores

F.D.A. Seeks Restrictions on Teens' Access to Flavored E-Cigarettes and a Ban on Menthol Cigarettes

FDA

- Raided manufacturers offices to seize documents
- \$60 million campaign targeting teen use

News & Events

Home > News & Events > Newsroom > Press Announcements

FDA News Release

FDA launches new, comprehensive campaign to warn kids about the dangers of e-cigarette use as part of agency's Youth Tobacco Prevention Plan, amid evidence of sharply rising use among kids

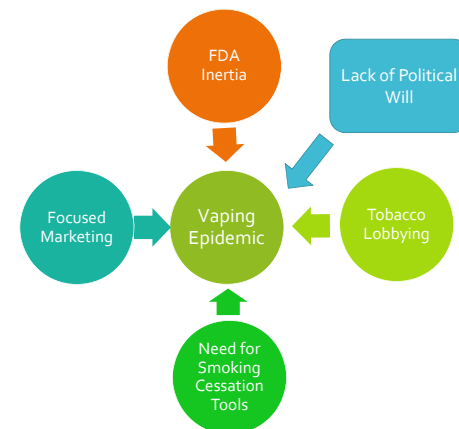
"The Real Cost" Youth E-Cigarette Prevention Campaign to target nearly 10.7 million at-risk youth through digital platforms, social media, and in-school ads nationwide

Some E-cigarette Users Are Having Seizures, Most Reports Involving Youth and Young Adults

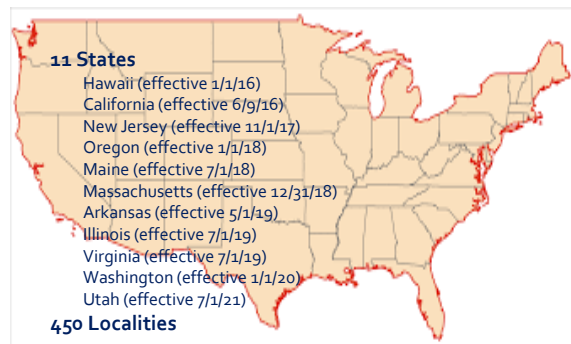
Schools try different methods to stem students' vaping habits **The Boston Globe**

- <https://www.fda.gov/TobaccoProducts/NewsEvents/ucm636333.htm>
- <https://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm620988.htm>
- <https://www.fda.gov/tobacco-products/labeling/production/ingredients/components/ucm666310.htm>

How did we get here?



Initiative to increase age for sale of tobacco products to 21 years – increasing



https://www.tobaccofreekids.org/assets/content/what_we_do/state_local_issues/sales_21/states_localities_MLSA_21.pdf

Many States are Initiating Some Form of Ban on E-Cigarettes

- Massachusetts Governor Baker called for 4 month ban on all e-Cigarettes
 - Rationale and goals
 - Pump brakes to assess the situation
 - Unintended consequences
 - Purchasing in NH, online
 - Impact smoking cessation
 - Small businesses possibly failing

Emma & Madison

What do we say to them about their vaping?



Have a conversation with your patients

- Get the facts and stay informed
- For parents:
 - Start a conversation
 - Ask and listen
 - Ask kids what they know and think about ENDS
 - Stress that ENDS *are not* harmless
- Resources
 - CDC info graphic:
 - <https://www.cdc.gov/tobacco/infographics/youth/pdfs/e-cigarettes-usb-flash-508.pdf>
 - Mass DPH Website:
 - <https://www.mass.gov/news/department-of-public-health-launches-campaign-to-highlight-the-dangers-of-vape-pens-and-e-cigarettes>
 - <http://makesmokinghistory.org/dangers-of-vaping/parents/>

In Summary

- Use of ENDS is increasing
 - The FDA has declared ENDS use in adolescents an EPIDEMIC
- ENDS use increasing rapidly among children and adolescents
 - Use of ENDS increases risk of smoking in teens
 - Use MJ seen in Middle School and HS students
 - Carcinogens and toxicants present
- ENDS as an effective tool for smoking cessation – preliminary findings hopeful but need further study
- There are known harms and potential harms
 - Most likely less dangerous than cigarette smoking - but long-term studies needed
 - *Balance harm reduction versus potential harm*

*Thank you
for
listening!!*



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