An Introduction To E-Cigarettes

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Conflicts of Interest

• No conflicts to disclose.
Overview

• Context
• E-cigarettes 101
• Public health conundrum
  ▪ Youth uptake
  ▪ Harm reduction
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Smoking in Society

• 14.0% of adult Americans smoke (2019)
The Toll of Cigarettes

• Leading preventable cause of death and disease
  ▪ 1 in 5 deaths
  ▪ 480,000 deaths/year
• Smokers lose an average of 10-20 years of life
• More than 16 million Americans suffer from at least one smoking-related disease
• ~$300 billion in medical care and lost productivity
• ~10% of annual healthcare costs
Smoking in Wisconsin
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What Is an E-Cigarette?

- A device that heats and vaporizes a liquid that contains nicotine designed to mimic the experience of smoking a conventional cigarette
- Many of the products are manufactured overseas (quality control?) while most of the liquids are manufactured in the U.S.
  - More than 250 brands
Disposable
Rechargeable
Vape Pens, Tank Systems, Mods
Pod Mods or Salts

- 1 pod = 1 pack of cigarettes
E-Liquids or “Juice”

• Usually contains:
  ▪ Propylene glycol
  ▪ Glycerin
  ▪ Water
  ▪ Nicotine – 3 mg and 5 mg
  ▪ Flavorings – 10,000+

• Nicotine salts – more nicotine, faster hit
Juul’s Nicotine Rush
E-cigarette Aerosol

• Not harmless
  • Formaldehyde, Acetaldehyde, Toluene, Nitrosamines
  • Cadmium, Nickel, Lead
  • Elevated VOC’s: Acrylonitrile, Acrolein, Propylene Oxide, Acrylamide, Crotonaldehyde
  • Particulate Matter

• Combustible cigarettes
  • 7000 chemicals
  • 50+ carcinogens
  • Cyanide, Carbon Monoxide, Arsenic, Benzene, Lead, Ammonia, Cadmium
E-cigarette Safety

- Adverse events are typically:
  - Mouth and throat irritation
  - Nausea
  - Headache
  - Dry cough
- More laboratory and pre-clinical than real-world use data
- Some flavors contain chemicals that are known to cause health problems
  - Diacetyl, cinnamaldehyde

• Most e-cigarettes contain and emit numerous potentially toxic substances
  ▪ **Conclusive evidence**

• E-cigarette use results in symptoms of dependence
  ▪ **Substantial evidence**

• Not clear whether e-cigarette use changes short-term adverse health outcomes in several organ systems in smokers who continue to smoke combustible tobacco cigarettes (dual users)
  ▪ **Insufficient evidence**
E-cigarette Conundrum
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High School Use - Cigarettes

Source: National Youth Tobacco Survey
American Lung Association
High School Use – Cigarettes and E-cigarettes

*Any use in the past 30 days

Source: National Youth Tobacco Survey
American Lung Association
Flavors and Youth

- Flavors play a major role in youth initiation and use
  - 81.5% of e-cigarette users use the product “because they come in flavors I like”

- 66% of teens think e-cigarettes are just vaping flavor

- 80% of WI high school students would not use unflavored products
  - 95% of middle school students

- FDA banned flavors in disposable pods (Juul)
Nicotine Effects on the Developing Brain

• Rewire the brain to:
  ▪ Increase risk of impulsivity and mood disorders
  ▪ Impact learning and memory
  ▪ Impact reward functioning
  ▪ Become dependent

• Increase risk of becoming a combustible cigarette smoker
  ▪ Recent paper questions this finding (Selya, et al., 2019)
    ▪ Kids who went on to smoke may have started smoking without e-cigarettes
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E-cigarettes and Smoking Cessation

• Moderate evidence from observational studies more frequent use of e-cigarettes is associated with increased likelihood of cessation

• Dual use is a common use pattern
  ▪ More than half e-cigarette users also smoke

• Cannot study e-cigarettes as a cessation medication/device in the U.S.
  ▪ UK Health Service prescribes them for cessation
E-cigarettes and Smoking Cessation

• New Zealand trial
  ▪ Nicotine patches + e-cigarette with nicotine: 7%
  ▪ Nicotine patches + placebo e-cigarette: 4%
  ▪ Nicotine patches: 2%

• UK National Health Service trial
  ▪ E-cigarette starter pack: 18.0%
    ▪ 80% of abstainers continued to use e-cigarettes
  ▪ 3 months of chosen NRT: 9.9%
    ▪ 9% of abstainers continued to use NRT
E-cigarettes As A Cessation Aid

Cochrane 2020 Conclusions

• E-cigarettes may help more people to stop smoking for six months or longer than using NRTs or nicotine free e-cigarettes.
• E-cigarettes may increase quit rates compared to no support, or behavioral support alone.
• The overall incidence of serious adverse effects related to e-cigarettes is low.
• There is not yet enough evidence to support claims that e-cigarettes are effective tools for quitting smoking.
  ▪ The effects are particularly unclear when it comes to newer types of e-cigarettes that have better nicotine delivery, and the effect of e-cigarettes when combined with an NRT.
Conclusions

- Smoking represents a significant public health concern
  - The leading preventable cause of death and disease
- E-cigarettes are an innovative technology to deliver nicotine
- E-cigarettes are not safe, but they appear to be less harmful than combustible cigarettes
- E-cigarettes have the potential to be a public health benefit (i.e., a harm reduction strategy) and a public health threat (i.e., increase youth addiction)