THE VAPING EPIDEMIC IN ADOLESCENTS

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A NOTE FROM THE AUTHORS

As health care professionals, we are pleased to present a co-produced contribution into the body of research and recommendations surrounding this topic. It is our belief that we are stronger when we work together.

We seek to educate and work toward a thoughtful reassessment of the role of medical and dental professionals in providing evidence-based treatment and counseling for patients. This article contains timely information and recommendations that professionals can utilize in their practice and share with their patients. In order to ensure we are offering the best care, it is important to be informed about choices, issues, products and devices that patients may be interacting with. We can help guide our patients using relevant resources to try to encourage an increased focus on their oral and overall health.

Signed,

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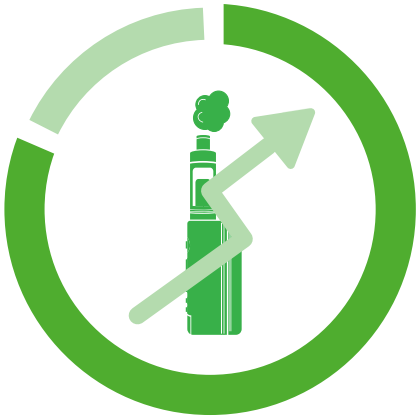
SUMMARY

The use of electronic cigarettes (e-cigarettes), popularly referred to as vaping, is a growing trend in the United States. Over the past 10 years, vaping rates have risen exponentially. In 2018, it was estimated that more than 10 million adults were current users of e-cigarettes[1].

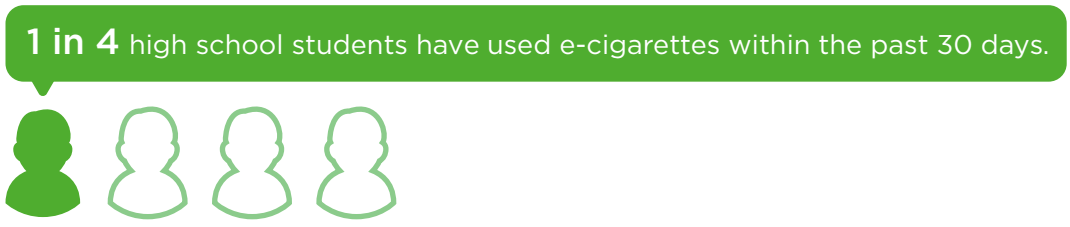
This trend has also shown a yearly rise among youth in experimentation and regular use, including a worrisome 78 percent increase in high school students from 2017 to 2018[2]. Preliminary 2019 data shows that one in 11 middle school students and one in four high school students reported vaping in the past 30 days[3]. This is an alarming rise from earlier this year when 2018 statistics showed one in 20 middle schoolers and one in five high schoolers reported e-cigarette use[2].



78%
Increase in regular e-cigarette use by high school students between 2017–2018.

Ongoing research is being conducted to assess the potential consequences of exposure to e-liquid ingredients, the effects of the resulting vapor, and the chemical compounds that are produced. However, life-threatening consequences have emerged due to the introduction of e-cigarettes. Serious injuries and even deaths have been caused by childhood liquid nicotine poisoning, vape device explosions, and most recently, an epidemic of severe respiratory illnesses stemming from e-cigarette use[4,5].

Although it may take years to fully understand the risks and benefits, we know that e-cigarettes are not safe. Vaping requires education and awareness on the part of dental and medical providers to counsel our patients appropriately about the risks and negative health effects.



SITUATION ANALYSIS

While e-cigarettes (also known as electronic nicotine delivery systems) have only been available in the United States since 2007, they have become widespread in adult populations. Based on the pattern of use, vaping is more popular with younger adults (18-24 year-olds) and, overall, more than half of current e-cigarette users are under 35[1].

Of greater concern, e-cigarettes have become the most popular tobacco product among middle and high school students[2]. Although e-cigarettes were originally touted as a smoking cessation tool, they have actually increased exposure of the addictive effects of nicotine to younger populations[2]. The use of vaping products has grown so quickly that, in December 2018, the U.S. Surgeon General declared e-cigarette use to be an epidemic among youth[6]. Recent data shows that vaping rates among high school seniors more than doubled from 2017 to 2018[2]. Previous research has shown that most adult cigarette smokers begin smoking prior to the age of 18[7].

There is evidence that the developing adolescent brain is particularly vulnerable to the risk of addiction due to ongoing brain maturation. For youth, e-cigarettes have been called a "one-way bridge" to smoking traditional cigarettes[8].

Multiple studies have documented that teens who use e-cigarettes are three to seven times more likely to transition to combustible cigarettes than teens who do not use them[2, 8, 9].

The value of e-cigarettes as a smoking cessation tool is still in question compared to other available options[10, 11]. Some studies show that, while few adult smokers may indeed quit nicotine all together, much larger numbers of youth are initially exposed to nicotine through e-cigarettes and are at significant risk of transitioning to traditional cigarette use[2, 8, 9, 12].

HOW THEY WORK

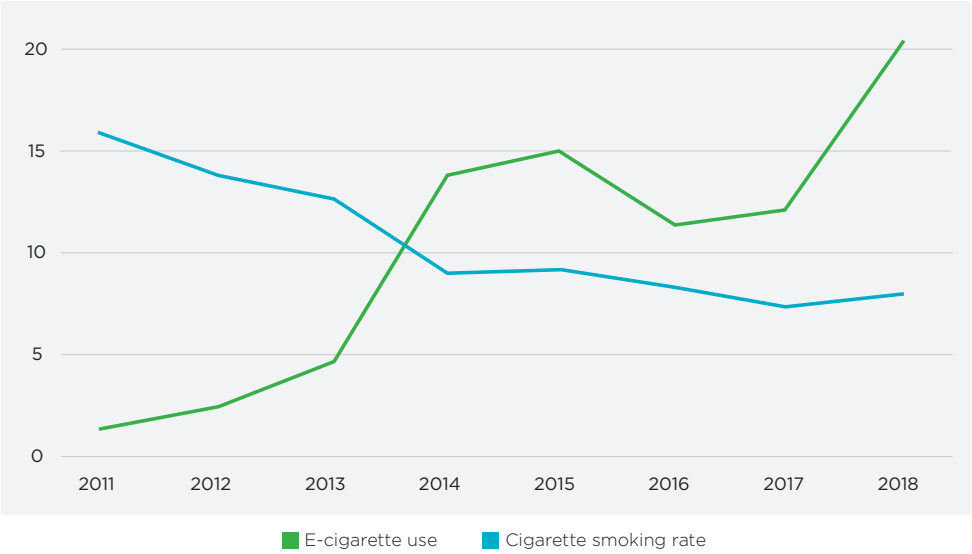
E-cigarettes function using a lithium battery that heats a liquid—also known as e-juice, e-liquid and pods—into an aerosol that is inhaled or "vaped"[2,13]. This aerosolized liquid usually contains nicotine. Some devices can be modified to aerosolize other additives, such as marijuana[2, 4, 5].

Typically, the component chemicals are altered by heating and some are known to be carcinogenic or toxic to organs[13]. Other e-liquid components can include volatile organic compounds, polyethylene glycol, formaldehyde, and additives for flavoring[13].

Flavoring is important because pure nicotine liquid has a bitter taste. With this knowledge, e-cigarette companies have capitalized on the appeal of fruity flavors to adolescents[2]. There are currently over 7,000 unique flavors of e-liquids, many of which have purposely targeted younger e-cigarette users[14].

HOW WE GOT HERE

Cigarette Smoking Vs. E-Cigarette Vaping Rate Among High School Students



The rate of high school students using e-cigarettes eclipsed the rate of those smoking cigarettes in 2014, according to the CDC's National Youth Tobacco Survey[5].

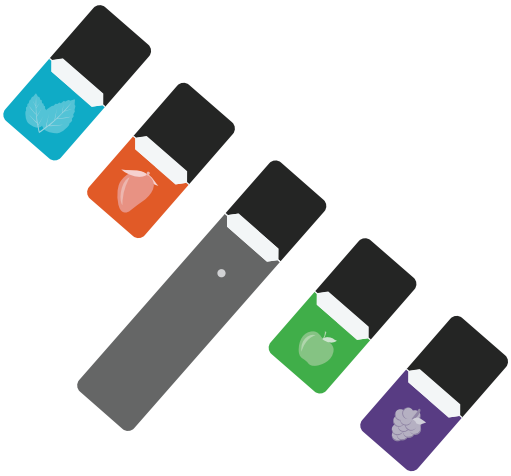
Youth who are exposed to nicotine in e-cigarettes have higher rates of becoming addicted to nicotine, and in turn, to smoking traditional cigarettes[8]. These next-generation smokers are undoing the significant strides of the past 30 years to alert the public about the lifelong health effects of nicotine addiction and cigarette smoking.

Student use of e-cigs eclipsed the rate of traditional cigarettes in 2014.

APPEALING TO YOUTH

The availability of flavors for vaping is an enticing factor for youth who have not used e-cigarettes before[12]. In one study, 81 percent of adolescents cited the availability of flavors as the most common reason for vaping[16]. Another reason for widespread use is the subversive design of various vaping devices[17]. According to one study, youth enjoy the "stealth" aspect of vaping that allows them to even use e-cigarettes while in classrooms[17].In another study, youth who used flavored e-cigarettes were more likely to respond that tobacco was not dangerous—and were more likely to start smoking cigarettes and less likely to quit vaping[12].

E-cigarette companies have been particularly adept at reaching young audiences. Strategies previously used during traditional cigarette marketing campaigns such as celebrity endorsements, cartoon imagery, music sponsorships, candy/fruit flavorings, and social media have successfully targeted American youth with messaging about e-cigarettes[2, 12, 16, 18].



These types of marketing tactics are no longer allowed for traditional cigarettes since the passage of the Master Settlement Agreement and the 2009 Family Smoking Prevention and Tobacco Control Act (FSPTC). The FSPTC specifically addressed the allure of fruit/candy flavorings of cigarettes and ruled that they could no longer be used, as many cigarette smokers initially started smoking by using a flavored product. The FSPTC does not currently apply to e-cigarettes.

SAFETY CONCERNS

SEVERE RESPIRATORY ILLNESSES

During the summer of 2019, an epidemic of severe respiratory illnesses associated with vaping was identified. Initial cases were reported in Illinois and Wisconsin[4], but the number of patients affected has increased rapidly since then. There are now more than 1000 reported cases in 48 states[5].

Nearly all patients reported respiratory symptoms such as shortness of breath, cough and chest pain[4]. Patients also complained of gastrointestinal symptoms and fever[4]. Many of the patients' conditions progressed to require hospitalization, intensive care and respiratory support[4]. To date, 26 patients have died in 21 different states due to their respiratory illness[5].

Investigations are ongoing, but no infectious cause has been identified. All affected patients reported e-cigarette use with a large percentage disclosing use of tetrahydrocannabinol (THC) and cannabinoid (CBD) oil products, while others reported use of nicotine products only[4,5].

In response to the ongoing reports of illness, the CDC advises against the use of e-cigarettes, particularly by youth, young adults, pregnant women and adults who don't currently use tobacco products[5].

SECOND HAND EXPOSURE

Exhalations by e-cigarette users has been mistakenly assumed to be "water vapor." Multiple studies have shown that this is not the case. Analysis of e-cigarette exhalations reveals the presence of nicotine, volatile organic compounds, metals such as nickel, cadmium and lead, as well as formaldehyde, acetaldehyde and acrolein[13]. A number of these chemicals, including formaldehyde, are classified as carcinogenic and acetaldehyde as a probable carcinogen[23].

The dangers of second-hand cigarette smoke, known as involuntary smoking, include exacerbation of respiratory illness, like asthma, in children and lung cancer in non-smoking adults [6,19].

Because e-cigarettes have only been around a little more than a decade, there is insufficient information regarding long-term health risks from exhaled vapor. Though it is known that e-cigarette exhalations contain substantially lower concentrations of carcinogenic components, the risks and long-term effects have not yet been confirmed.

CHILDHOOD NICOTINE POISONING

The toxicity of nicotine-containing e-liquids is a serious problem for children. From 2012 to 2017, there were over 8,000 poison control center reports of liquid nicotine exposure in children under 6 years of age[24]. In 2014 alone, rates peaked at over 4,000 cases reported. Sadly, there have also been reports of child deaths due to exposure[24].

Most e-liquids contain nicotine of varying amounts[17]. There have been reports of toxic ingestions, which have been related to liquid nicotine preparations that are sold in highly concentrated forms for users to dilute at home prior to using with e-cigarette devices[12, 17, 24]. Another dangerous aspect of nicotine liquid is that it's readily absorbed through skin and mucous membranes[24]. This similar mechanism of action is used in nicotine patches and lozenges.

The multitude of e-liquid flavorings like fruit, dessert and candy make them appealing to younger children. Marketing efforts have compounded the danger as the packaging on some e-liquid containers can resemble juice boxes, cookies, and whipped cream, which entices curious toddlers and young children[24].

The rapid rise of reports of accidental ingestions and exposures led to the passage of the Child Nicotine Poisoning Prevention Act of 2015, which requires child-resistant packaging[2, 24]. As of May 31, a total of 1,722 cases of e-cigarette devices and nicotine exposures have been reported during 2019 alone[25]. Unfortunately, the e-cigarette industry has evaded stringent controls and won't be reviewed again until 2022[2].

BURNS AND DEVICE EXPLOSIONS

E-cigarette devices contain lithium-ion batteries as the power source. Lithium-ion batteries have been identified as the cause of multiple reports of e-cig device explosions and fires[26]. The majority of the explosions occurred while the e-cigarette device was in a pocket or in use[26]. Multiple reports also blame the use of inappropriate chargers[26].

Between 2009 and 2016, there were nearly 200 explosions, resulting in 133 acute injuries, 29 percent of which were classified as severe injuries[26]. Severe injuries include burns of the oral cavity, tooth luxation injuries and serious permanent damage to the dentition, including tooth loss[27].

Because of the long, slender, "cigarette-like" design of many e-cigarettes, fires have occurred when the device acts as a projectile, igniting nearby clothing, drapes or furniture[26]. Additionally, 2018 saw media reports confirming the first adult death from an e-cigarette explosion[28].

CONCLUSION

To help alleviate the vaping epidemic, dental and medical providers can take the following steps:

- **Advise** patients to avoid all tobacco products including e-cigarettes.
- **Educate** all users about the toxicity of liquid nicotine preparations, particularly in homes where there are young children.
- **Stay informed** on research about the long-term effects of vaping on users and second-hand exposure.
- **Support regulations** to limit youth access to e-cigarettes and measures to eliminate flavored e-liquids.

Find additional resources at

DeltaDentalMN.org

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