

November 2018 ~ Resource #341102

E-Cigarette and Vaping FAQs

FDA has described the use of e-cigarettes and vaping in youth as an epidemic.¹ E-cigarettes were originally marketed as a strategy for adult smokers addicted to nicotine to have access to a noncombustible form of nicotine.² There is no role for the use of e-cigarettes in youth.³ But e-cigarette products appeal to youth (even non-smokers) with their flavors, discreetness, designs, social media advertising, online videos, etc.⁴ In particular, pod e-cigarettes (e.g., *Juul*, *Vuse*, etc) have seen a dramatic increase in use by youth, currently accounting for more than half of e-cigarette sales.³ *Juul* has been described as the “iPhone of e-cigarettes.”^{4,5} These devices are small, discreet, and have been reportedly used undetected by students during classes.^{4,5} FDA and Health Canada are increasing regulations of e-cigarettes in an attempt to reduce their use in youth.^{1,6} New restrictions include trying to decrease youth access (with possible ban of online sales), bans on flavorings (e.g., bubblegum, cake batter, gummy bear, etc), restriction of marketing targeting youth, and education to the public on the dangers of e-cigarettes.¹ Identifying e-cigarette users can be tricky, as many people who “vape” do not identify themselves as smokers or even e-cigarette users.⁴ Ask youth about their use of “vaping” products, as this term seems to be more popular in this age group. The chart below answers common questions about vaping and e-cigarettes including use, safety, and regulations.

Clinical Question	Answer/Pertinent Information
What are e-cigarettes?	<ul style="list-style-type: none"> • E-cigarette is a common term for “electronic nicotine delivery systems (ENDS).” Other terms used include vaping devices, electronic cigarettes, electronic vapor products (EVPs), vape pens, e-cigars, e-hookah, etc. • The act of using these devices also has several descriptors; including vaping, <i>Juuling</i>, etc.^{4,7} • Sizes and shapes of e-cigarettes vary (e.g., shaped like cigarettes, pens, flashlights, flash drives, etc).⁶⁻⁸ • The device heats a liquid to produce an aerosolized vapor which is inhaled. • The liquids used may be called e-juice, e-liquid, etc.^{6,9} Other substances used include wax, salts, and herbs.⁶ • E-cigarettes can be “opened” and refilled. Others are “closed,” using disposable cartridges, pods, mod pods, etc.
Do e-cigarettes contain nicotine?	<ul style="list-style-type: none"> • Most e-cigarettes contain nicotine; however, there are some nicotine-free e-liquids. • Nicotine concentrations vary from very low to more than is found in tobacco cigarettes.^{10,11} • Many e-cigarette products use “free-base” nicotine. However, higher nicotine concentrations of free-base nicotine are reported to cause “aversive user experiences.”⁹ • Newer devices, (e.g., <i>Juul</i>) contain protonated nicotine, derived from nicotine salts in tobacco.⁹ <ul style="list-style-type: none"> ▪ Manufacturers claim that the salt-based solution plus additives can deliver higher levels of nicotine with less throat irritation and a more “satisfying experience” for the user.³ ▪ Each <i>Juul</i>pod contains 0.7 mL of a 59 mg/mL nicotine solution, the equivalent of about 20 tobacco cigarettes.⁹ <i>Juul</i> is reported to have the highest nicotine content available in the U.S. (two to ten times the nicotine concentration of most other e-cigarettes).^{3,9}

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Clinical Question	Answer/Pertinent Information
<p>How are e-cigarettes used?</p>	<ul style="list-style-type: none"> • E-cigarettes are marketed to be used for smoking cessation. In addition, they are also being used for recreation in persons who have never used tobacco cigarettes, particularly in youth. • E-cigarettes are also used in alternate ways (with and without nicotine); such as for smoke tricks (including competitions), inhalation of flavors, inhalation of other substances (e.g., marijuana), etc. There is an abundance of information on ways to use and manipulate these devices online and within social media.¹² • “Dripping” is one alternate use that may be increasing the danger of e-cigarettes. The e-liquid is dripped directly onto the heating coil of the device and the resulting vapor is inhaled quickly. Exposing the liquid to this higher temperature may increase the release of toxins (e.g., formaldehyde, acetaldehyde, acetone, etc) in the vapors. “Dripping” is reported to give users thicker clouds of vapor, improved flavor, and a stronger “throat hit” (which appears related to a certain [higher] level of nicotine). Higher temperatures may also increase the nicotine in the vapor, leading to higher nicotine serum levels.¹² • For “dabbing,” high-concentrations of cannabinoids (often tetrahydrocannabinol [THC] or cannabidiol [CBD]) are dropped onto the heating elements of e-cigarette devices.⁴³
<p>What are the risks of nicotine in e-cigarettes?</p>	<ul style="list-style-type: none"> • Nicotine is highly addictive.^{3,6} Using e-cigarettes can cause addiction to nicotine.⁶ • The adolescent brain is more susceptible to nicotine addiction than fully developed brains of adults.^{6,13} • Nicotine alters brain development.⁶ It can affect cognitive function, memory, and attention when used while the brain is still developing into the mid-20s.^{3,5,6} • There are no long-term data on the risks of nicotine delivered via e-cigarettes (e.g., heart, lungs, etc).¹⁵ <ul style="list-style-type: none"> ▪ There are some preliminary data for cardiac effects. One small study in otherwise healthy volunteers (21 to 45 years) showed an association between users of e-cigarettes and a shift in cardiac autonomic balance toward sympathetic predominance and increased oxidative stress.¹⁶ • Nicotine is absorbed in e-cigarette users. Approximate saliva concentration of a nicotine metabolite (cotinine):¹⁷ <ul style="list-style-type: none"> ▪ E-cigarettes (average use 220 puffs/day; variable nicotine content): 353 ng/mL ▪ Tobacco cigarettes (26 per day): 340 ng/mL ▪ Nicotine patch 21 mg: 165 ng/mL ▪ Nicotine nasal spray, 24 doses per day: 150 ng/mL to 200 ng/mL • E-cigarettes are a source of secondhand exposure to nicotine and other chemicals. The risks of secondhand vapor are unknown but are expected to be lower than tobacco smoke. Caution is recommended around non-users, youth, pregnant women, people with cardiovascular conditions, etc.^{6,18}

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<p>Are e-cigarettes safe?</p> <p><i>Continued</i></p>	<ul style="list-style-type: none"> • Severe lung disease associated with the used of e-cigarette products has been reported in hundreds of patients (mostly teenagers) in the U.S. CDC is investigating these cases and have confirmed at least six deaths as of September 12, 2019.⁴⁴ <ul style="list-style-type: none"> ▪ Symptoms develop over a few days to several weeks and have included cough, shortness of breath, chest pain, nausea, vomiting, diarrhea, fatigue, fever, and weight loss.⁴⁴ ▪ Lung infection as a cause has not been identified and it is believed the symptoms are associated with chemical exposure.⁴⁴ ▪ In response to the reports of acute pulmonary illnesses linked to the use of vaping products in the U.S., Health Canada has issued an information update regarding the risks of vaping products. They recommend anyone using vaping products should monitor themselves for symptoms of pulmonary illness (e.g., cough, shortness of breath, chest pain).⁴⁵ ▪ Any suspected cases of pulmonary disease associated with e-cigarettes/vaping should be reported to local or state health departments, following the recommendations in CDC’s Health Advisory statement, found at https://emergency.cdc.gov/han/han00421.asp. ▪ The use of cannabinoids in e-cigarettes and vaping devices has been reported in many cases of e-cigarette-associated severe lung disease.⁴⁶ • E-cigarette use has also been linked to milder respiratory symptoms (cough, wheezing, etc).²² • There is one case report of a previously healthy 18-year-old diagnosed with hypersensitivity pneumonitis after e-cigarette use.²³ • Analysis of common brands of e-cigarettes showed contents included propylene glycol, glycerol, glycerin, flavorings (e.g., diacetyl), diethylene glycol, ethylene glycol, ethanol, formaldehyde, and acrolein. The effect of chronic exposure to these chemicals is not known.^{6,19,20,47} <ul style="list-style-type: none"> ▪ Some of these ingredients are generally regarded as safe (e.g., propylene glycol) when used orally; however, their safety when inhaled is unknown.^{47,48} ▪ When propylene glycol and glycerin are heated, toxic aldehydes are formed. Inhaling these toxins has unknown effects.⁴⁷ ▪ Bronchiolitis obliterans (also called “popcorn lung”) is associated with the inhalation of flavorings (e.g., diacetyl); found in microwave popcorn, other food products, and e-cigarette products. There have been no reports of “popcorn lung” associated with the use of e-cigarettes.⁴⁸ • There have been case reports of acute lipoid pneumonia associated with the inhalation of oil via e-cigarette devices.⁴⁹ <ul style="list-style-type: none"> ▪ In most cases of lipoid pneumonia, cannabis oils seem to have been used in the e-cigarette devices.⁴⁹ ▪ Most commercially available e-cigarette liquids do not appear to contain oils.⁴⁹ ▪ Patients should not inhale any oil-based liquids in e-cigarette devices.⁴⁹ • Seizures and other neurological symptoms (e.g., tremors) have been reported in patients using e-cigarettes. FDA is investigating these reports and their association with e-cigarettes.⁵⁰

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Clinical Question	Answer/Pertinent Information
Safety, continued	<ul style="list-style-type: none"> • The Canadian Lung Association warns that urgent action must be taken to decrease vaping in youth and that inhaling e-cigarette vapor causes cough, wheezing, worsening of asthma symptoms, and unknown long-term effects.²¹ • The American Lung Association has called for CDC and FDA to state that e-cigarettes are not safe, that they contain dangerous chemicals that can cause severe and irreversible lung damage and disease, and that the public should stop using e-cigarettes and vaping.⁵¹ • The release of chemicals and contaminants (e.g., nickel, tin, aluminum, lead) in e-cigarette vapor varies between devices and the way they are used. More chemicals are released (e.g., formaldehyde [a known carcinogen], etc) at higher temperatures (e.g., with “dabbing” or “dripping” [described in the “How e-cigarettes are used” section above]).^{6,12,14,20,48}
Are youth who use e-cigarettes at risk of becoming smokers?	<ul style="list-style-type: none"> • Preliminary evidence suggests that youth who use e-cigarettes are more likely to smoke tobacco cigarettes and use cannabis at a later age than youth who don’t use e-cigarettes.^{24,25,47}
Are e-cigarettes effective for smoking cessation?	<ul style="list-style-type: none"> • E-cigarettes are not an approved smoking cessation aid. • Some smokers claim that e-cigarettes make them “feel better” than when smoking tobacco cigarettes, that they save money, and that e-cigarettes help them to quit smoking.²⁶ • Some evidence supports the use of e-cigarettes to help patients quit smoking.^{2,6,27,28,42} • Royal College of Physicians (U.K.) supports the use of e-cigarettes, in combination with behavioral therapy, in smokers who have tried other methods of quitting without success.^{29,30} • Patients who want to quit smoking should be advised to use approved nicotine replacement products. <ul style="list-style-type: none"> ▪ For practical tips and resources to help your patients successfully quit smoking see our toolbox, <i>Smoking Cessation: Helping Patients Who Use Tobacco</i>. ▪ If patients have failed multiple attempts with approved nicotine replacement/smoking cessation products they could try e-cigarettes.^{15,31}
Can e-cigarettes be used in public places?	<ul style="list-style-type: none"> • Rules vary, but many public places (airplanes, hotels, etc) consider e-cigarettes and vaping within their no-smoking policies.³² • E-cigarettes can trigger some types of smoke alarms.³³ • Rarely, e-cigarettes have been associated with explosions (due to the lithium battery) and fires causing serious burns and death.^{6,34}

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Clinical Question	Answer/Pertinent Information
<p>Can e-cigarettes be used by hospitalized patients?</p>	<ul style="list-style-type: none"> • Many hospitals include e-cigarette use by patients and visitors in their no smoking policies.³⁵ • Patients who use e-cigarettes may experience a withdrawal syndrome from nicotine. • Hospitalized patients who cannot use e-cigarettes should be offered nicotine replacement therapy if needed. The amount of nicotine in e-cigarettes can vary. Some hospital nicotine replacement protocols recommend starting e-cigarette patients on low-dose nicotine replacement therapy, then monitoring and titrating as needed.
<p>Are there poisonings with e-cigarettes?</p>	<ul style="list-style-type: none"> • The flavorings of e-liquids and designs of the devices are very appealing to children. They must be kept in a safe place, out of reach of children and pets.⁶ • As e-cigarettes have become more popular, poison centers report an increasing number of exposures to nicotine-containing e-liquids, from 271 cases in 2011 to 3,073 cases in 2015.³⁶ • Commercially available e-liquids can contain up to 100 mg/mL of nicotine. • Just 1 mg of nicotine can cause adverse symptoms in a toddler, and 6 mg/kg to 13 mg/kg can be lethal.^{37,38} • Poisonings from e-liquids are reported from ingestion, skin contact, or by inhalation.³⁹ • Symptoms of nicotine toxicity can include nausea, vomiting, diarrhea, salivation, weakness, hypertension, and tachycardia. In severe cases; seizures, coma, and death can occur.⁴⁰ • Use caution when handling e-liquids to avoid skin exposure, due to the potential for topical nicotine absorption.
<p>How are e-cigarettes regulated?</p>	<ul style="list-style-type: none"> • Regulations for e-cigarettes and vaping are evolving. • FDA and Health Canada regulate all aspects of e-cigarettes and vaping products; including packaging, promotion, banning of ingredients or devices, etc.^{1,6} • Vaping products with nicotine are available to adults as an alternative to smoking.⁶ • E-cigarettes are not able to be purchased by those younger than 18 years of age in Canada and the U.S.^{6,41} • Healthcare professionals are also calling for regulations on these devices that may prevent them from being manipulated for alternative uses (e.g., dripping, etc).¹²
<p>What information is available to help educate patients about the risks of e-cigarettes?</p>	<ul style="list-style-type: none"> • CDC and Health Canada offer information sheets to help parents talk with their teenagers about e-cigarettes (https://e-cigarettes.surgeongeneral.gov/documents/SGR_ECig_ParentTipSheet_508.pdf and https://www.canada.ca/en/services/health/publications/healthy-living/talking-teen-vaping-tip-sheet-parents.html). • FDA has expanded its Youth Tobacco Prevention Plan to include tools to help prevent vaping in youth with The Real Cost of Vaping (http://www.scholastic.com/youthvapingrisks/). • There are little data on effective strategies to quit e-cigarettes. Patients can consider traditional smoking cessation strategies, but keep in mind that even data for smoking cessation in teenagers are limited. See our toolbox, <i>Smoking Cessation: Helping Patients Who Use Tobacco</i>, for practical tips and resources.

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