



Department of  
**Mental Health &  
Substance Abuse Services**



8/15/2016

**Substance Use Best Practice Tool  
Guide**

**APPENDIX B: e-Cigarettes**

Division of Clinical Leadership in Collaboration with the  
Division of Substance Abuse Services

## E-Cigarettes

Electronic cigarettes, or e-cigs as they are sometimes referenced, are battery-powered devices that vaporize a flavored propylene glycerin or glycol solution, with or without nicotine, to simulate smoking a cigarette (Pepper, Emery, Ribisl, & Brewer, 2014; Rahman, Hann, Wilson, & Worrall-Carter, 2015; Tremblay et al., 2015). Some e-cigs contain a vegetable glycerin solution and some manufacturers have started to mix the two solutions in an attempt to give users what they believe is the best of both worlds (QuitSmokingCommunity.org, n.d.). E-cigs are readily available on the Internet and in local convenience stores, and have become a popular alternative to traditional (i.e., combustible/conventional) cigarettes (Williams, To, Bozhilov, & Talbot, 2015). These products are also fast emerging as a public health challenge (Tremblay et al., 2015).

E-cigarettes are part of the growing landscape of electronic nicotine delivery systems (ENDS). Introduced to markets in the United States in 2007, ENDS also includes e-hookahs, e-cigars, hookah pens, and vape pens (CDC, 2015; Gourdet, Chriqui, & Chaloupka, 2014; Tremblay et al., 2015). E-cigarette users refer to their use of the product as vaping (EHP, 2014). When e-cigarettes came on the scene, they were largely promoted as a smoking cessation tool. However, results around this potential benefit have not been as promising as desired. The quit rate for smokers that used e-cigarettes for smoking cessation was seven percent, compared to about six percent for individuals that used existing smoking cessation aids. Better results were evident for clients treated with placebo e-cigarettes (i.e., e-cigarettes without nicotine). Nearly 60 percent of those clients successfully quit smoking compared to those given e-cigarettes containing nicotine (Maa, 2015).

The nicotine solution in e-cigs can be flavorless, but manufacturers tend to add flavors. Flavors range from the sophisticated mint chocolate truffle and whiskey, e.g., to the baldly juvenile, like cotton candy, gummy bears, and bubble gum. Seven of 10 middle and high school students that currently use e-cigs have used a flavored product (King, 2015). In general, flavorings are safe, but the safety of e-cig flavorings has not yet been established. At least one flavoring, diacetyl, has been linked to bronchiolitis obliterans (Samet, 2015). Nevertheless, it is extremely difficult to quantify exposure. Each manufacturer of e-cigs has a different design for the device and e-liquid. As a result, the vapor amount varies (EHP, 2014). There are at least 450 different brands of e-cigs that can be categorized according to the following three types: 1) minis or cigalikes; 2) mid-sized; and 3) tanks or mods (King, 2015).

Not unexpected, persons that perceive e-cigs as less addictive or harmful than traditional (i.e., combustible) cigarettes demonstrated the highest prevalence of use (Chapman & Wu, 2014). Other characteristics of users of e-cigarettes include the following:

- Former and current smokers are more likely to use e-cigs than persons who were never smokers (Perry et al., 2014; Rahman et al., 2014).
- E-cigarettes are more likely to have ever been used by adults 18 - 34 years of age.
- Surprisingly, e-cigarette use was more prevalent among persons with more education.
- Elderly adults (aged 65 and over) were less aware of e-cigarettes than non-elderly adults (Chapman & Wu, 2014).

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- Adults who want to stop smoking and switch to e-cigarettes increase the likelihood that they will not quit. Instead these individuals tend to become dual users (CDC, 2015).
- Adults who smoke and switch to e-cigarettes improve their health outcomes by eliminating the disease-related issues of tobacco smoking (CDC, 2015; Farsalinos & Polosa, 2014).

It is estimated that 18 percent of smokers in the United States have tried e-cigs. When the user inhales, airflow is created and the flow trigger is activated. A light-emitting diode (LED) light comes on and the heating element vaporizes the solution in the cartridge into mist. The mist containing the nicotine is what is inhaled by the user (Rahman et al., 2014).

A study by Pepper et al. (2014a) examined how adults learned about e-cigs. The researchers found that smokers tended to band together and share information about e-cigs, as did sole users of e-cigs. The Internet further played a substantial role in reinforcing word-of-mouth messages about e-cigs.

- Youth and young adults, in particular, perceive that e-cigarettes are safe (AVA, 2015). Among young adults, around 12 percent of e-cigarette users have never tried traditional (i.e., combustible/conventional) cigarettes (Chapman & Wu, 2014). Moreover, 20 percent of middle school-age students reported they started using tobacco directly through e-cigarettes. They did not use traditional cigarettes as a gateway—a statistic that raises concern about e-cigs becoming the gateway to traditional (i.e., combustible/conventional) cigarette use (CDC, 2013; Pepper, McRee, &

Gilkey, 2014b). Nevertheless, the literature shows that adolescents who start with e-cigarettes increase the likelihood that they become combustible users (CDC, 2015).

**NYTS results reflect a continuing growing trend in e-cig use among young people (CDC, 2015).**

At the time of this writing, the most current national data about youth and e-cigarettes was collected during 2011-2013. The data collection was part of the National Youth Tobacco Survey (NYTS) and results were not favorable. Survey participants included students in grades 6-12 enrolled in public and private schools. Results reflected a continuing growing trend in e-cig use among young people (CDC, 2015).

	2011	2014
Reported ever using e-cigs	1/20	1/4
Used e-cig in past 30 days	1/50	1/8.1

Source: CDC, 2015

The most disturbing data involving youth and e-cigs focused on exposures to children under the age of six and nicotine poisoning. Calls to the poison control centers are escalating. Researchers conducting a retrospective study using data from the National Poison Data System from January 2012 – April 2015 found 29,141 calls related to nicotine/tobacco product exposures to young children, with e-cigs accounting for 14 percent of the exposures. Moreover, the monthly e-cigarette exposures increased significantly by nearly 1500 percent during the study. Specifically, children exposed to e-cigs had 5.2 times higher odds of hospitalization and 2.6 times higher odds of severe medical outcomes than those who were exposed to cigarettes. The data also revealed that ingestion alone was the most common route for e-cig exposure (Parry, 2016).

## Regulatory Efforts

E-cigs have been banned in 13 countries worldwide, in part due to their potential for promoting substance use in addition to nicotine addiction, as marijuana and other illicit substances can be vaped (Maa, 2015). Until this year (i.e., 2016), the FDA only regulated cigarettes, cigarette tobacco, roll-your-own tobacco, and smokeless tobacco. However, effective August 8, 2016, the FDA's authority is extended to include the regulation of e-cig delivery systems, which includes e-cigs and vape pens, hookah (water pipe) tobacco, all cigars, pipe tobacco, and nicotine gels, among others. Most states had planned or enacted regulation addressing e-cigs, electronic smoking devices, or vapor products (Tremblay et al., 2015). Seventy percent of states

have implemented limited and targeted regulations, e.g., use in limited venues, sale to and/or use by minors). About 16 percent of states have enacted relatively comprehensive regulations such

as use in public places or mixed, diverse regulations. Only seven states (14 percent) had no regulations targeting e-cigs (Tremblay et al., 2015). Awareness regarding the existence of e-cigarettes has grown dramatically across all demographic groups, particularly among current smokers and young adults (Gourdet et al., 2014). It should be noted that Tennessee is one of the states that had laws explicitly addressing e-cigarettes prior to the new FDA ruling.

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## Current Issues

How to properly regulate this product continues to be an ongoing debate, particularly as it relates to youth access, the potential of youth for nicotine addiction, and renormalization of the smoking culture. Long-term health effects of vapor inhalation through e-cigs are unknown at this time (Gostin & Glasner, 2014; Tremblay et al., 2015). Furthermore, many questions remain unanswered about the dangers of e-cigs, both to smokers and to those around them (Maa, 2015).

Two early claims of potential benefit of e-cigs over traditional cigarettes have been refuted. There are carcinogens in e-cigarettes and the secondhand vapor from e-cigs contains nicotine or other toxic chemicals, unlike otherwise reported (Maa, 2015). E-cigs also pose health hazards that have not been associated with traditional cigarettes. For instance, parents have made large numbers of calls to poison control centers due to accidental ingestion of liquid nicotine by children. There have also been reports of persons inadvertently putting e-cig fluid into their eyes because they mistook the storage bottles for eye drops (Maa, 2015).

Questions still need to be answered regarding the consequences and toxicity of direct contact of liquid nicotine on the skin. Malfunctioning e-cig batteries and accidental activation of the heating element have ignited fires in homes, high school gymnasiums, and airplanes. The latter results prompted the Federal Aviation Administration (FAA) Safety Alert to recommend a ban on e-cigs in checked baggage. Additional research is continuing (Maa, 2015).

E-cigs may expose bystanders to emissions. A team of researchers observed increased indoor air levels of coarse particulate matter, polycyclic aromatic, hydrocarbons, and aluminum following

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indoor vaping sessions lasting two hours each. Pollution in the air, however, does not appear to reach the levels of conventional (i.e., traditional or combustible) cigarettes (EHP, 2014). Some researchers have suggested that the metals in e-cig aerosols be removed to diminish the possibility of adverse health effects from prolonged use (Williams et al., 2015). Typical components of aerosols include nicotine, aerosol, flavorings, and other contaminants including formaldehyde (Samet, 2015).

Issues around the possibility that e-cigs are creating more nicotine addictions than they are attenuating are of great concern. Hence, a regulatory agenda that controls negative use trends while permitting use for cessation, if deemed beneficial, has been recommended. Regulation should control the drivers of negative use such as non-quit –related recreational use. To address this, the product should not be sold at low cost, made widely available, or given access to unfettered marketing (Rahman et al., 2014).

Studies involving healthcare providers have demonstrated their struggles working with clients using e-cigs. A study by Pepper et al. (2014b) showed nearly all (92 percent) of the providers were familiar with e-cigs but only slightly more than 10 percent had actually treated adolescent clients who had used them. Providers did not feel they had sufficient knowledge to work with adolescent clients that used e-cigs and reported discomfort working with them and/or their parents. Providers in this study were physical health practitioners.

States that have legalized or decriminalized the recreational use of marijuana will further need to address the sale of e-cigs pre-loaded with D-9-tetrahydrocannabinol (THC) (Wiesman, 2014). Additionally, adolescents are using e-cigs to vaporize cannabis. The e-cig is modified to allow for vaporization in the form of highly concentrated waxy forms of THC, highly concentrated liquid hash oil, or dried cannabis leaves or buds. Vaporizing cannabis via e-cigs is less conspicuous than the combustible means of smoking cannabis. Of added concern with this method is the fact that the THC concentrations can greatly exceed that of dried cannabis by as much as 30 times (Morean, Kong, Camenga, Cavalio, & Krishnan-Sarin, 2015).

A study by Morean et al. (2015) examined the extent to which young people use e-cigs to vaporize cannabis. The researchers found this practice to be common among high school students, especially if the student reported lifetime dual use of cannabis and e-cigs. The sample included individuals in a state in which both sale of e-cigs and cannabis to people under the age of 18 were illegal. Results indicated lifetime cannabis users, e-cig users, male students, and younger students were more likely to use e-cigs to vaporize cannabis than their peers that did not fall into those categories. The relative safety of this practice is not well established.

The literature shows that adults who vaporize hash oil experience greater evidence of dependence and subjective tolerance than those who smoke combustible cannabis. Such negative observations have been linked to the greater potency of the THC-infused waxes and hash oil compared to combustible cannabis. Adolescents who vaporize tend to engage in this practice in locations where such use is prohibited. Vaporization of cannabis via e-cigs further makes detection by parents/caregivers and/or law enforcement more difficult because the pungent, characteristic odor of smoked cannabis is hidden (Morean et al., 2015).

Also of note is the fact that e-cig ads are the first cigarette ads that our youth have seen on television. Cigarette sponsorship of television programming has been banned in this country since 1998. However, policy relating to conventional (i.e., combustible/traditional) cigarettes are not directly applicable to e-cigs (Wiesman, 2015).

In the meantime, there are actions that can be taken to protect young people from any negative impact associated with tobacco use via e-cigs. Among them are the following:

- Reducing demand for e-cigs through health promotion and public education.
- Reducing supply of e-cigs for licensed retailers. At this writing, the only state to require retailers selling vapor products to purchase a license is Kansas.
  - Raising the legal age for purchases to the age of majority—21 years (Wiesman, 2015).

There are many questions about e-cigs. More rigorous research is needed to answer critical questions about the effects of e-cigs on human health and the potential benefit/risk ratio. Rigorous research will ensure health care professionals can make informed decisions that maximize human safety and minimize the potential ill effects e-cigs may have on clients and the public in general (Palazzolo, 2013).

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