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Adolescent Use of Electronic Cigarettes: An Emergent Health Concern for Pediatric Nurses

Molly Johnson MSN, APRN-CPNP, CNE[a,*], Nicole Pennington DNP, RNC[b]

[a]*Ohio University Southern, Department of Nursing, Ironton, OH*
[b]*Ohio University Southern, Dean's Office, Ironton, OH*

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Recent statistics show an increasing trend of electronic cigarette usage among adolescents. Despite common misconceptions, electronic cigarette use does not reduce cigarette use among adolescents and can potentially increase cigarette dependence via nicotine addiction and modeling of smoking behaviors. Pediatric nurses and health care providers should be aware of the popularity and safety concerns of electronic cigarettes so that they can properly provide education regarding the possible negative health effects of adolescent electronic cigarette use, raise awareness of this public health concern, and impact policies in their communities.

A NEW CLINICAL concern in the area of adolescent health is the use of electronic cigarettes. In 2011, 1.5% of high school students reported ever using an electronic cigarette. In 2012, 2.8% reported having used one of the devices. This analysis comes from the Centers for Disease Control and Prevention's National Youth Tobacco 2011–2012 Survey that also shows that 1.1% of middle school students reported ever using an electronic cigarette in 2012, up from 0.6% in 2011. It is estimated that as of 2012, 1.78 million students have tried an electronic cigarette. An estimated 160,000 students who reported ever using an electronic cigarette also reported that they had never used a regular, tobacco cigarette (CDC National Youth Tobacco Survey, 2013).

Many countries have already banned or strictly regulated electronic cigarettes (Torjesen, 2013). E-cigarettes that deliver nicotine are classified as drugs under the Food and Drugs Act in Canada. If sold without nicotine they are subject to the Canada Consumer Product Safety Act. (Miller, 2014). The European Union recently ruled that individual countries have the liberty to decide if they wish to regulate them as medical devices (Miller, 2014). The United States has exempted them from regulation as drug-delivery devices at the present time (Benowitz & Goniewicz, 2013; Drill, 2013). Despite this exemption, some states and larger cities have applied their own restriction. North Dakota, New Jersey and Utah as well as the cities of New York, Chicago, and Philadelphia restrict electronic cigarette use in public areas. Eleven other states, including Arkansas, Colorado, Delaware, Hawaii, Maryland, New Hampshire, Oklahoma, Oregon, South Dakota, and Vermont, restrict electronic cigarette use in other venues (American Nonsmokers' Rights Foundation, 2014).

The products are sold without restriction and are not subject to the same regulation as actual cigarettes (Chen, 2013; McGill, 2013). The sale of electronic cigarettes by one company in Canada is expected to exceed $10 million in 2013 (Rollans, 2013). The presence of electronic cigarettes on the Internet where people sell on commission is increasing rapidly (Yamin, Bitton, & Bates, 2010). Since the overall impact of electronic cigarettes on public health remains uncertain, the use of these devices is concerning as is the possibility of these products being gateways to traditional cigarette smoking.

* Corresponding author: Molly Johnson, MSN, APRN-CPNP, CNE.
E-mail addresses: johnsom4@ohio.edu.

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Components of Electronic Cigarettes

In 2007, the electronic cigarette was introduced to the United States' market (Rollans, 2013). These devices are battery-powered and designed to look like a regular tobacco cigarette. Not all electronic cigarettes contain nicotine, but many do. Most of them have replaceable cartridges, and some are disposable. A typical electronic cigarette has the following components: a mouthpiece, an atomizer, and a battery. The mouthpiece holds the replaceable cartridge in which the smoker sucks or inhales. The liquid solution within the electronic cigarette is often flavored and may contain nicotine. It is heated by an atomizer which creates an aerosol that the user inhales. This inhalation of vapors has led to the creation of the nickname "vapers" for users of electronic cigarettes. The electronic cigarette's heating element is normally powered by a rechargeable lithium-ion battery. In addition, the electronic circuitry includes the airflow sensor, a timed cutoff switch to prevent overheating, and a colored light emitting diode to indicate that the device has been activated. To use the device, it is placed between the lips and inhaled. This causes the activation of the heating element which immediately vaporizes a liquid solution which can consist of a combination of nicotine, water, propylene glycol, glycerol and flavoring (McQueen, Tower, & Sumner, 2011). The use of the electronic cigarette simulates the act of smoking, and the colored light emitting diodide even simulates the glow of tobacco. However, no actual smoke is generated with this device.

Regular use of nicotine comes with its own health risks, with or without cigarettes. It is known that nicotine use can lead to increased risk of heart disease, stroke and cancers of the lungs, mouth and throat, according to the Centers for Disease Control. In electronic cigarettes, the nicotine is contained in the solution that is heated and vaporized and then inhaled as a vapor into the mouth (Goniewicz, Kuma, Gawron, Knysak, & Kosmider, 2013).

Manufacturers claim that electronic cigarettes are a safe alternative to regular tobacco cigarettes because the user does not inhale harmful tobacco smoke, which contains over 4,000 toxic chemicals (Caponnetto et al., 2013). This has been questioned by the Food and Drug Administration (FDA). When analyzed by the FDA, samples were found to have variable amounts of nicotine and traces of toxic chemicals, including carcinogens (Benowitz & Goniewicz, 2013). Some of the tested samples also contained toxic substances such as tobacco-specific nitrosamines, and one contained diethylene glycol. These findings prompted the FDA to issue a warning about potential health risks associated with electronic cigarettes. Since there is no tobacco in the electronic cigarette, they are not subject to United States tobacco laws. This means that they can be purchased by anyone regardless of age.

Electronic cigarette manufacturers report that they do not market to children; however, electronic cigarettes come in flavors like strawberry, bubble gum, gummy bear, and cookies and cream. This is concerning as the devices may be particularly attractive to young people and therefore encourage nicotine addiction among children and adolescents. Adolescents perceive these new products positively and are willing to experiment with them (Choi, Fabian, Mottey, Corbett, & Forster, 2012). Because some electronic cigarette marketers have started giving out free samples of their product, there is the potential that more children and adolescents may try the products and subsequently start smoking electronic cigarettes.

Not knowing what long-term health risks can occur is cause for concern. In the 1950s, the dangers of smoking traditional tobacco cigarettes were becoming clear, and the tobacco industry started to worry about sales. At that time, manufacturers came up with filter-tipped, low-tar, and light cigarettes. It is now clear that these cigarettes were not necessarily safer than traditional cigarettes. Internal documents later revealed that they promoted "safer" cigarettes to discourage people from quitting (Smoke without fire, 2013).

Review of Literature

Little is known about the potential health impact of electronic cigarettes or the extent of their use. Furthermore, there is a lack of evidence about the awareness and perceptions young people have of these products. The latest research indicates that there are potential negative health effects with electronic cigarette usage. A literature review was performed using CINAHL and Medline data-bases. Search dates were limited to 2009–2014. Inclusion criteria consisted of articles specifically addressing health concerns related to the use of electronic cigarettes. Exclusion criteria consisted of articles that were not applicable to identifying and addressing specific health concerns. Search terms and phrases used in the review process consisted of electronic cigarettes, e-cigarettes, adolescent health, nicotine, and smoking. The initial search resulted in 227 articles. Using combined search terms to provide for specific information in relation to the health effects resulted in 43 articles. After an initial review of the 43 articles, 35 articles were selected for inclusion.

Though this article focuses on the potential negative health effects of electronic cigarettes, it is important to note that when perusing the literature, conflicting studies were found that addressed the ability of electronic cigarettes to either reduce tobacco use or cause total tobacco cessation (Bullen et al., 2013; Caponnetto et al., 2013; Choi et al., 2012; Dawkins, Turner, Roberts, & Soar, 2013; Farsalinos & Romagna, 2013; Flouris et al., 2012, 2013; Goniewicz, Kuma, Gawron, Knysak, & Kosmider, 2013; Sutfin, McCoy, Morrell, Hoeppner, & Wolfson, 2013; Trumbo & Harper, 2013; Vansickel, Weaver, & Eissenberg, 2012). For those trying to achieve tobacco cessation, the literature also provides some support of electronic cigarettes being a safer and healthier choice compared to conventional tobacco cigarettes (Cahn & Siegel, 2011; Caponnetto et al., 2013;