

The Rise of E-cigarettes: Harmful or Harm-Reducing?

By Cassandra
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With the popularity of e-cigarettes skyrocketing, medical experts and health officials aim to discover if the devices are safe and if they could be effective smoking cessation aids for tobacco users.



Electronic cigarettes, or e-cigarettes, have continued their rise in popularity, and in some populations, such as young people, they are displacing traditional tobacco cigarettes as the preferred method of nicotine consumption. While many see e-cigarettes as another harmful trend, others believe the devices provide an opportunity to help millions of smokers quit. This article will explore the latest news and research on e-cigarettes, the impact of inevitable regulation by the US FDA, and the devices' potential as a smoking cessation aid.

Facts and Figures

From 2010 to 2013, the use of electronic nicotine delivery systems, also known as e-cigarettes, more than doubled among US adults, according to a study by researchers at the US Centers for Disease Control and Prevention (CDC) and Georgia State University and reported by *USA Today*.¹ In addition, it is estimated that more than 20 million US adults have tried them at least once.¹

The prevalence of e-cigarette use among American youth is evident in recent data released by the CDC and the FDA's Center for Tobacco Products (CTP). The findings from the 2014 National Youth Tobacco Survey show that current e-cigarette use among high school students rose from 4.5% in 2013 to 13.4% in 2014.² This is the first time since the survey started collecting data on e-cigarettes in 2011 that current use has surpassed use of every other tobacco product, including conventional cigarettes, the CDC report said. In addition, more than a quarter of a million youths who had never smoked a cigarette used e-cigarettes in 2013.

“The surge in youth use of novel products like e-cigarettes forces us to confront the reality that the progress we have made in reducing youth cigarette smoking rates is being threatened,” Mitch Zeller, JD, director of the CTP, said in a CDC news release. “These staggering increases in such a short time underscore why FDA intends to regulate these additional products to protect public health.”

The research regarding the potential health impact of e-cigarettes for users and the public is still emerging. However, experts note that several different areas, including secondhand exposure to e-cigarettes and nicotine exposure to adolescents, may be cause for concern and warrant future scientific research.

E-Liquids and E-Juice

The nicotine contained in some e-cigarette liquids is one element of these products that may pose a risk to a user’s health. According to Michael Siegel, MD, professor of community health sciences, Boston University School of Public Health, “Nicotine is addictive and nicotine also has some cardiovascular effects. It is a cardiovascular stimulant and also it has detrimental effects on pregnancy.” Additionally, Siegel explained that for individuals with severe coronary artery disease, nicotine may exacerbate the condition. As such, Siegel believes caution should be observed with these particular users.

Another possible risk is the nicotine exposure to adolescents. “Adolescence is a critical time for brain development. Nicotine exposure at a young age may cause lasting harm to brain development, promote addiction, and lead to sustained tobacco use,” Tom Frieden, MD, CDC director, explained in a CDC press release.² Meanwhile, Erika Sward, assistant vice president for National Advocacy, American Lung Association, said, “This does not bode well for a tobacco-free generation.”

The liquid used in e-cigarettes may also pose a possible health risk to children. Siegel explained that the liquids are so heavily concentrated with nicotine that they may be poisonous to children, particularly toddlers and infants. “The users of these products need to make sure that they keep them out of the reach of children and I believe that there should be regulations that require these e-liquids to be in childproof containers,” he said.

Respiratory Impact

The fine particles of e-cigarettes may also be of concern, according to Stanton Glantz, PhD, director of the Center for Tobacco Control Research and Education and professor at the University of California, San Francisco. Glantz explained that not enough time has passed to be able to measure the heart attack risk and to prove conclusively that the ultra-fine particles in e-cigarettes have the same effects as those in cigarettes and diesel exhaust. However, “There have been several studies now that show that when you breathe in e-cigarette aerosol it degrades your lung function in ways quite similar to the way a cigarette does, which is what you would expect,” Glantz said.

In regard to secondhand exposure to e-cigarette vapor, it is not currently known if secondhand e-cigarette emissions are harmful; however, it may be a possible health risk according to experts. “There have been some very troubling studies that show the user is exhaling formaldehyde, benzene, and other toxins, and so where e-cigarette emissions fall in terms of comparisons to secondhand smoke is not the question. It’s whether or not they are actually clean,” said Sward. “Initial studies have been very clear that there’s a lot to be concerned about in terms of the user’s exhale.”

Siegel noted, however, that no acute risks of active vaping have been identified. “I think that the dangers of exposure to second hand vapor are minimal. With the vapor, it really dissipates rather quickly and so the exposure is really acute exposure, rather than chronic exposure,” he said.

Glantz also says the precise dangers associated with secondhand exposure have not been defined and that it will take years for conclusive evidence to be found. Nevertheless, he noted, “The fact that they pollute the air, that they

put toxic chemicals into the air, and the fact that these toxic chemicals are absorbed by bystanders is already well-established.”

Dual Use

Another potential risk of e-cigarettes is that smokers may be using them along with traditional cigarettes. “What we’re seeing is that people who smoke cigarettes are using e-cigarettes in addition to smoking cigarettes, so it’s something called, ‘dual use,’” Sward said. As the health risks of cigarettes to users and bystanders are well established, the continued use of cigarettes is a significant danger in dual use of these products.

In addition, the issue of dual use appears to be common among young adults. According to Sward, the 2014 National Youth Tobacco Survey conducted by the CDC revealed that among the one-in-four American youths who are using a tobacco product, almost half are using two or more tobacco products.² The data from the CDC does not indicate what the combination of products are, such as e-cigarettes and regular cigarettes, but Sward believes the use of two or more products is troubling.

Glantz echoed that sentiment and said dual use may be one of the larger problems associated with e-cigarette use. “The other [problem] is increasingly the big cigarette companies are taking over the e-cigarette market and they’re marketing their products in a way that promotes dual use, which is what you would expect them to do [for] maximizing profits,” Glantz said.

As present research regarding the safety of e-cigarettes is not conclusive, Siegel believes that any possible health risks of e-cigarettes are minimal and are far less than the dangers associated with tobacco use. “If a smoker switches to e-cigarettes, they’re definitely doing something that’s going to improve their health,” he said.

According to the National Institute on Drug Abuse, e-cigarettes have not been thoroughly evaluated in scientific studies and for now, little data exists on the safety of e-cigarettes.³ “Probably the biggest risk associated with e-cigarettes in terms of health is that nobody knows what the risks really are,” Glantz said. “There are a lot of reasons to expect substantial risks, but it’s going to be years before all of that’s worked out.”

State and Federal Regulations

In April 2014, the FDA—which does not currently regulate the sale or manufacturing of e-cigarettes or e-cig liquids—proposed formal federal regulations that would regulate e-cigarettes as tobacco products. Presently, the FDA regulates only cigarettes, cigarette tobacco, roll-your-own tobacco and smokeless tobacco. However, if the new regulations are adopted, newly “deemed” products like cigars, pipe tobacco, and e-cigarettes would fall under FDA oversight, which would be welcomed by many critics of e-cigs.

“The most effective ways to reduce tobacco use across the board are policies and laws,” Sward said. Sward explained that the regulations propose a number of standards for the e-cigarette industry, including good manufacturing practices, ingredient disclosure, preventing e-cigarette sales to minors, and making sure that companies are not making health claims that have not been verified by the FDA.

The challenge for this federal agency is deciding to enact regulations though the “science is not yet settled,” and the FDA has admitted that it did “not currently have sufficient data about these products to determine what effects e-cigarettes have on the public health,” according to an article by *Health Affairs*.⁴ The FDA’s proposed regulations must go through a public notice and comment process before the agency can implement the rules, and the FDA will likely make changes in response to this process. The agency is accepting public comment until July 2, 2015, with the final version of the regulations expected later this summer.

In regards to federal regulation of e-cigarettes, Siegel believes that a set of minimum safety standards for companies to follow is the most effective approach. He explained that industry standards could include issues like battery safety

(regulations to prevent exploding batteries), temperature regulation (ensuring that the liquid is not heated enough to produce formaldehyde), and requirements for childproof and leak-proof cartridges to prevent child accidents.

With the lack of federal regulation, a number of states and local governments are passing laws to regulate the devices. Common regulations at the state and local level include indoor use bans, sales bans, licensing requirements, and bans on sales to minors. A news report from *The Wall Street Journal* indicates that, as of January 2015, 60-plus bills that aim to rein in the e-cigarette industry are being considered in 21 state legislatures.⁵

E-cigarette legislative challenges include Oregon bills banning flavors and online sales, an Indiana bill that would require pricey permits for retailers selling liquid nicotine, and a California bill banning e-cigarettes in public places. Gubernatorial proposals include New York Governor Andrew Cuomo's budget, which would ban flavors, restrict advertising, and prohibit indoor e-cigarette use. Several states are also considering e-cigarette taxes.

"In terms of dealing with the e-cigarette epidemic, the real responsibility for it...is falling on local and state governments. Most of the meaningful action, like in everything else in tobacco control, has been at the local level," according to Glantz.

Sward stated, "Ultimately, FDA has to make its decisions based on what is appropriate for the protection of public health. E-cigarettes are a tobacco product, and it's very important that the Obama administration give [the] FDA the authority it needs to begin its work to oversee these and protect the public health."

E-cigarettes and Smoking Cessation

An area of marked disagreement among experts and health officials is whether or not e-cigarettes can be effective tools to help the 42.1 million adults in the US who smoke traditional cigarettes quit. Several studies have shown that e-cigarettes can play a positive role in reducing smoking rates, while others have not proven their effectiveness as long-term smoking cessation aids.

For example, a study published in *The Lancet* found that six months into smoking e-cigarettes, 7.3% of users had quit smoking tobacco, which is statistically equivalent to the patch, according to a report in *The New York Times*.⁶ Natalie Walker, PhD, one of the study's authors, told the *Times*. "We were surprised by the low quit rate." However, Walker believes e-cigarettes have the potential to be another tool due to their popularity over other nicotine replacement strategies.

In contrast, another study conducted in Great Britain and published in the journal *Addiction* examined e-cigarette use for smoking cessation and determined that daily use of e-cigarettes while smoking appeared to be associated with increases in rates of attempting to stop smoking and reducing smoking, but not with smoking cessation.⁷ The authors of the study noted that non-daily use of e-cigarettes while smoking does not appear to be correlated with cessation, cessation attempts, or reduced smoking.

Presently, the FDA has not found any e-cigarette to be safe and effective in helping smokers quit, Sward said. "It is the responsibility of a company which thinks that their product may help someone quit smoking, and is actually safe and effective, to come to the FDA and prove it. So far, while the application would be kept confidential, the FDA certainly hasn't approved any e-cigarette as safe and effective."

With the evidence currently available, Glantz believes it is quite consistent that e-cigarettes keep people smoking. "The problem is that any benefits that they're seeing are being swamped by the fact that, for most people, the effect is to keep them smoking," he said. "I think to have a chance that e-cigarettes will help people quit smoking, the first thing they have to do if they try them is to quit smoking and not to just use them concurrently with cigarettes, to be dual users."

Additionally, Glantz also said that in order for e-cigarettes to be used as a smoking cessation aid studies need to be

conducted showing their effectiveness as such and need to be submitted to the FDA. Subsequently, then the use of them in marketing needs to be controlled in a way that supports their uses for quitting, Glantz explained.

Conversely, Siegel believes that e-cigarettes have the capability of being an effective smoking cessation tool because they address the pharmacological and behavioral aspects of smoking addiction. “We know from both anecdotal evidence from testimonials and from survey evidence e-smokers have used these products and are using these products successfully to quit smoking,” Siegel said. “The advantage of electronic cigarette is that it does simulate smoking. I think that is important to many smokers because it’s one of the reinforcing aspects of the smoking behavior.” Essentially, if it looks and feels like smoking, a smoker may have more success.

Overall, Sward asserted, “We’re very concerned about the impact on the public health, and ultimately e-cigarettes are not a quit-smoking approved drug or device.”

Impact on Tobacco Use and Related Deaths

In addition to the matter of whether or not e-cigarettes can be effective as smoking cessation aids, another relevant issue is if these devices can impact tobacco use. According to Sward, “Based on everything we have seen, there doesn’t seem to be evidence to suggest that that is going to happen. Number one, we’re seeing people use both products. Number two, we are seeing kids uptick significantly in this.” Sward added, “Really what we’re seeing is another tobacco product and the likelihood of consequences associated with it.”

Glantz also believes that the use of e-cigarettes is supporting traditional tobacco products in the current marketplace. “The existence of e-cigarettes is inhibiting quitting by established smokers and it’s promoting nicotine addiction and smoking among kids,” he explained.

With the possibility that switching from tobacco cigarettes to e-cigarettes may positively impact one’s health, the use of these products may have benefits for smokers and reduce tobacco-related deaths. In a commentary, the Royal College of Physicians in London wrote, “For the smoker who cannot quit, or wants to continue to use nicotine in a manner that resembles smoking, e-cigarettes are an obvious choice. Switching completely from tobacco to e-cigarettes achieves much the same in health terms as does quitting smoking and all nicotine use completely.”¹

With a number of adult smokers using e-cigarettes to either quit smoking or reduce the amount of cigarettes smoked (in addition to youth who may be substituting these devices for traditional cigarettes), Siegel believes e-cigarettes are favorably impacting standard cigarette use and have a positive effect on health. “We know that when people switch to vaping, they experience an immediate improvement in their health symptoms. It’s been documented that there is a significant decline in respiratory symptoms among smokers who quit...by switching to electronic cigarettes,” Siegel said. “Ultimately, I think the current evidence suggests that these products are causing a decline in tobacco consumption. There’s clearly a potential for these products to create major public health improvement.”

Research and the Future of E-cigarettes

With the spotlight on e-cigarettes in the media and among healthcare professionals, future research will continue to emerge, and experts believe there are a few key areas that research should focus on in the future. According to Siegel, future research should focus on the following areas:

- The effectiveness of e-cigarettes to help smokers quit;
- Studies on the health status of individuals who have switched from smoking to e-cigarettes; and
- How e-cigarettes can be made safer.

Of these key areas of research, Siegel said, “I do think that ultimately we would like to have a clearer picture of whether or not there are long-term effects.”

Glantz said prospective research should also include longitudinal studies of youth to determine how big the gateway to smoking is and what the long-term use patterns are for kids who use e-cigarettes. Additionally, Glantz says more studies are needed on the cardiovascular effects and non-cancer pulmonary effects of e-cigarettes, establishing if the fine particles in e-cigarettes have the same kind of harmful effects as other fine particles, and, most importantly, determining the effects of long-term use of these products.

“These are all important and interesting scientific questions, but I think we know enough to take prudent action at this point,” Glantz said. “If you sit by and do nothing, you’re going to have this epidemic fully established and it’s going to be much harder to deal with even than it is now.” **RT**

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